Postprint: Regional Differences in Disability and Its Influencing Factors Among Middle-Aged and Elderly Populations in China's Three Major Regions

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Abstract

Background The intensification of population aging and major chronic disease issues in China will inevitably lead to an increase in the number of disabled individuals, resulting in greater pressure on social elderly care and heavier burdens on government and family elderly care responsibilities. Simultaneously, the uneven distribution of health resource allocation will pose more severe challenges to the medical care and nursing of the disabled population. Objective To investigate the differences in disability rates, severity levels, and influencing factors among middle-aged and elderly individuals in the eastern, central, and western regions of China. Methods Data from the 2018 China Health and Retirement Longitudinal Study (CHARLS) were analyzed from October 5, 2022 to January 13, 2023, with 19,170 middle-aged and elderly individuals aged 45 years and above as the study subjects. Disability was assessed using the Activities of Daily Living (ADL) scale and the Instrumental Activities of Daily Living (IADL) scale. The disability status and severity level of middle-aged and elderly individuals were treated as dependent variables, and independent variables were selected from three aspects—general demographic characteristics, health evaluation, and lifestyle—based on the CHARLS questionnaire content. Binary and multinomial Logistic regression analyses were conducted on the influencing factors of disability status and severity level among middle-aged and elderly individuals in the eastern, central, and western regions. Results Comparisons of disability rates and severity levels among middle-aged and elderly individuals in the eastern, central, and western regions showed statistically significant differences (2 = 143.014, P < 0.001; 2 = 136.356, P < 0.001). Mild disability was predominant among middle-aged and elderly individuals across all three regions. The age composition of middle-aged and elderly individuals with mild and severe disability differed significantly across the eastern, central,

and western regions ($P < 0.05$). The influencing factors of disability and its severity exhibited both commonalities and regional characteristics across the three regions. Age, education level, and self-rated health status were common influencing factors for disability among middle-aged and elderly individuals in all three regions ($P < 0.05$). Gender and physical disability were independent influencing factors for disability among middle-aged and elderly individuals in the eastern region ($P < 0.05$), with the risk of disability being 86.0% higher in females than in males (OR = 1.860, 95%CI = 1.036–3.338). Marital status and chronic disease were independent influencing factors for disability among middle-aged and elderly individuals in the central region ($P < 0.05$). Residence location and brain damage/intellectual impairment were independent influencing factors for disability among middle-aged and elderly individuals in the western region ($P < 0.05$). Conclusion Targeted prevention and treatment strategies should be formulated based on regional differences in disability status and influencing factors among middle-aged and elderly individuals. By strengthening health education, improving the construction of primary care-community health management systems, and providing regionalized medical services and rehabilitation guidance, we can reduce disability levels among middle-aged and elderly individuals, strictly prevent the worsening of disability severity, and alleviate regional disparities in disability.

Full Text

Regional Differences in Disability and Its Influencing Factors among Middle-aged and Elderly People in Three Major Regions of China

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Abstract

Background: The intensification of population aging and major chronic disease problems in China will inevitably increase the number of disabled individuals, resulting in greater pressure on social care systems and heavier burdens on both government and families. Simultaneously, the uneven allocation of health resources poses even more severe challenges to medical treatment and nursing care for the disabled population.

Objective: To explore differences in disability rates, disability severity, and

influencing factors among middle-aged and elderly people across China's eastern, central, and western regions.

Methods: Data from the 2018 China Health and Retirement Longitudinal Study (CHARLS) were analyzed from October 5, 2022, to January 13, 2023. A total of 19,170 middle-aged and elderly individuals aged 45 years and above were selected as study subjects. Disability was assessed using the Activities of Daily Living (ADL) scale and Instrumental Activities of Daily Living (IADL) scale. Disability status and severity were treated as dependent variables, while independent variables were selected from three aspects based on the CHARLS questionnaire: general demographic characteristics, health evaluation, and lifestyle. Binary and multinomial logistic regression analyses were conducted to examine factors influencing disability status and severity among middle-aged and elderly people in the three regions.

Results: Statistically significant differences were found in disability rates and severity among middle-aged and elderly people across the eastern, central, and western regions (^{2}=143.014, P<0.001; ^{2}=136.356, P<0.001). Mild disability predominated in all three regions. The age composition of middle-aged and elderly people with mild and severe disability differed significantly across regions (P<0.05). Both common and region-specific factors influenced disability and severity. Age, education level, and self-rated health status were common influencing factors across all three regions (P<0.05). Gender and physical disability were independent influencing factors in the eastern region (P<0.05), with women facing 86.0% higher disability risk than men (OR=1.860, 95%CI=1.036–3.338). Marital status and chronic disease were independent influencing factors in the central region (P<0.05). Residence and brain damage/intellectual impairment were independent influencing factors in the western region (P<0.05).

Conclusion: Targeted prevention and treatment strategies should be formulated to address regional differences in disability status and influencing factors. By strengthening health education, improving primary and community health management systems, and providing regionalized medical services and rehabilitation guidance, we can reduce disability levels, prevent severity progression, and alleviate regional disparities.

Keywords: health resources; disability; middle-aged and elderly people; regional differences; root cause analysis

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1. Methods

1.1 Data Source

As China's population aging intensifies, the country is approaching a "silver wave." This study utilized data from the 2018 China Health and Retirement Longitudinal Study (CHARLS), which aims to collect high-quality microdata representative of Chinese households and individuals aged 45 and above. The

2018 CHARLS data covered 19,816 respondents from 12,400 households across 28 provinces (autonomous regions, municipalities), 150 counties, and 450 communities (villages). Data extraction was performed from October 5, 2022, to January 13, 2023.

Inclusion criteria: (1) aged 45 years and above; (2) matching personal ID numbers between basic information and health status; (3) complete key data on disability-related questions. **Exclusion criteria:** missing data on demographic, health, or disability variables. A total of 19,170 eligible samples were included in the final analysis.

1.2 Research Methods and Content

1.2.1 Regional Classification Based on provincial information available in CHARLS data, this study defined eastern regions as: Beijing, Tianjin, Liaoning, Hebei, Shandong, Jiangsu, Shanghai, Zhejiang, Fujian, and Guangdong (10 provincial-level administrative areas). Central regions included: Heilongjiang, Jilin, Shanxi, Anhui, Jiangxi, Henan, Hunan, and Hubei (8 areas). Western regions comprised: Inner Mongolia, Guangxi, Chongqing, Sichuan, Guizhou, Yunnan, Shaanxi, Gansu, Qinghai, and Xinjiang (10 areas).

1.2.2 Disability and Severity Assessment Disability was assessed using the Activities of Daily Living (ADL) scale and Instrumental Activities of Daily Living (IADL) scale. CHARLS includes six ADL items (dressing, eating, bathing, getting in/out of bed, toileting, continence) and six IADL items (housework, cooking, shopping, making phone calls, taking medication, managing money). All 12 items share the same response options: (1) no difficulty; (2) have difficulty but can still complete; (3) have difficulty and need help; (4) cannot complete.

Following established criteria, individuals selecting “no difficulty” or “have difficulty but can still complete” for all 12 items were classified as independent. Those selecting “have difficulty and need help” or “cannot complete” for at least one item were classified as disabled. Severity was categorized as: mild disability (1–2 items), moderate disability (3–4 items), and severe disability (5–6 items) with such responses.

1.2.3 Variable Selection Disability status and severity served as dependent variables. Independent variables were selected from three domains based on the CHARLS questionnaire: (1) general demographic characteristics (gender, age, ethnicity, residence, religion, marital status, education); (2) health evaluation (self-rated health, number of chronic diseases, physical disability, brain damage/intellectual impairment, vision, hearing, pain); and (3) lifestyle (social activity, smoking, drinking, sleep duration). To improve explanatory power in logistic regression models, some continuous and categorical variables were recoded into discrete categories. Detailed variable coding is shown in Table 1 .

1.3 Statistical Methods

SPSS 25.0 was used for data analysis. Categorical data were presented as frequencies and percentages, with between-group comparisons using ^{2} tests. Binary and multinomial logistic regression analyses examined influencing factors of disability status and severity in eastern, central, and western regions, with significance level set at α=0.05.

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2. Results

2.1 Basic Characteristics of Middle-aged and Elderly People Across Regions

Among the 19,170 valid samples, 6,553 (34.18%) were from eastern regions, 6,424 (33.51%) from central regions, and 6,193 (32.31%) from western regions. The sample included 9,090 males (47.42%) and 10,080 females (52.58%). Age distribution was: 8,278 (43.18%) aged 45–59 years, 8,410 (43.87%) aged 60–74 years, and 2,482 (12.95%) aged $ $75 years.

Significant differences were found across regions in residence, ethnicity, education, marital status, religion, self-rated health, physical disability, brain damage/intellectual impairment, chronic disease, number of chronic diseases, vision, hearing, pain, sleep duration, drinking, social activity, and smoking (P<0.05). No significant differences were observed in gender or age distribution (P>0.05). Details are shown in Table 2 .

2.2 Comparison of Disability Status and Severity Across Regions

The total number of disabled middle-aged and elderly people was 4,780, yielding an overall disability rate of 24.93%. Regional rates were: eastern 20.01% (1,311 cases), central 26.09% (1,676 cases), and western 28.95% (1,793 cases). The difference in disability rates across regions was statistically significant (P<0.05). Mild disability predominated in all regions, with significant differences in severity distribution (P<0.05). See Table 3 .

The age composition of disabled individuals differed significantly across regions (P<0.05), while gender composition did not (P>0.05). See Table 4 . The age composition of those with mild and severe disability also differed significantly across regions (P<0.05). See Tables 5 through 7 .

2.3 Binary Logistic Regression Analysis of Disability Influencing Factors

Using disability status as the dependent variable (1=yes, 0=no) and including gender, age, residence, ethnicity, education, marital status, religion, self-rated health, physical disability, brain damage/intellectual impairment, chronic disease, number of chronic diseases, vision, hearing, pain, sleep duration, drinking,

social activity, and smoking as independent variables (coding shown in Table 8), the analysis revealed that age, education level, and self-rated health were common influencing factors across all three regions (P<0.05).

Specifically, individuals aged $ $75 years had 3.8–7.0 times higher disability risk than those aged 45–59 years, while those aged 60–74 years had 1.7–3.4 times higher risk (P<0.05). Those with high school education or above had 61.9%–88.8% lower disability risk than illiterate individuals (P<0.05).

Gender and physical disability were independent influencing factors in the eastern region, with women facing 86.0% higher disability risk than men (OR=1.860, 95%CI=1.036–3.338), and those without physical disability having 65.2% lower risk than those with disability (P<0.05). Marital status and chronic disease were independent factors in the central region, with widowed individuals having nearly 5 times higher disability risk than married individuals, and those without chronic disease having 27.4% lower risk than those with chronic disease (P<0.05). Residence and brain damage/intellectual impairment were independent factors in the western region, with rural residents having 5.8 times higher disability risk than urban residents (P<0.05). See Table 8.

2.4 Multinomial Logistic Regression Analysis of Disability Severity Influencing Factors

Using disability severity as the dependent variable (1=mild, 2=moderate, 3=severe) and the same independent variables (coding shown in Table 9), the analysis revealed that age, education level, self-rated health, and brain damage/intellectual impairment were common factors affecting severity across all regions (P<0.05).

Individuals aged $ $75 years had 72.7%–87.4% higher risk of moderate or severe disability compared to those aged 45–59 years (P<0.05). Illiterate individuals had 2.6–9.5 times higher risk of moderate or severe disability than those with high school education or above (P<0.05). Those with good or fair self-rated health had 63.2%–78.7% lower risk of moderate or severe disability than those with poor self-rated health (P<0.05). Those with brain damage/intellectual impairment had 2.3–3.2 times higher risk of moderate or severe disability than those without (P<0.05).

Gender, social activity, and physical disability influenced severity in both eastern and western regions, with women having at least 44.3% higher risk of severity progression than men (P<0.05). Those with social activities had nearly 40.0% lower risk of moderate or severe disability than those without (P<0.05). Those with physical disability had nearly 3.6 times higher risk of moderate or severe disability than those without (P<0.05). Ethnicity and sleep duration were unique influencing factors in the central region, with Han Chinese having 66.2% lower risk of moderate or severe disability than ethnic minorities (P<0.05), and those sleeping 6–8 hours having 45.5% lower risk than those sleeping <6 hours (P<0.05). See Table 9 .

3. Discussion

This study found an overall disability rate of 24.93% among middle-aged and elderly people, similar to the 25.6% rate reported by Chen Ling et al. using the Physical Self-Maintenance Scale. The eastern region had the lowest disability rate, while the western region had the highest, likely due to more developed economies, higher per capita income, and more abundant social welfare and medical resources in eastern regions, enabling better access to high-quality medical and nursing services.

Regional differences in disability severity were also observed, with mild disability predominating across all regions. No gender differences were found in mild, moderate, or severe disability across regions, possibly because the overall health status and physical function of the study population were relatively good, resulting in milder disability levels. Improved living standards, medical technology, healthcare resources, and widespread health education may have enabled middle-aged and elderly people to better understand their health status through regular check-ups, health consultations, and personalized medical plans, thereby preventing and mitigating disability. Additionally, health education and promotion activities provided by society and government agencies have helped enhance health awareness and disease prevention skills, delaying disability progression and improving life satisfaction and social participation.

The study demonstrates that influencing factors of disability and severity vary spatially, consistent with findings by Liu Jinhua et al. regarding spatiotemporal differences in disability determinants. Age, education level, and self-rated health affected both disability rates and severity progression across all regions. Illiterate elderly individuals with physical disability faced the highest disability risk.

Gender and physical disability were independent influencing factors in the eastern region, with women at higher risk than men, consistent with studies by Jiang Jianye et al. and Yin Zhenhua. Marital status and chronic disease were independent factors in the central region, with widowed individuals facing nearly 5 times higher disability risk than married individuals, aligning with Liu Chang's finding that unmarried, divorced, or widowed elderly have higher disability risk. Residence and brain damage/intellectual impairment were independent factors in the western region, with rural residents facing 5.8 times higher disability risk than urban residents, as also found by Fu Yu.

To reduce regional disparities in disability rates and severity, several measures are recommended. First, strengthen training for healthcare personnel to improve professional standards and service capacity while rationally allocating health workforce resources according to regional needs and population distribution to ensure equitable coverage. Second, increase health fiscal expenditure in less developed regions to improve health facilities and service levels, adjusting

fiscal allocation mechanisms to ensure fairness and meet the medical, preventive, rehabilitative, and healthcare needs of disabled elderly. Third, establish cross-regional health resource allocation mechanisms to address gaps through resource sharing and coordination, creating platforms for health resource cooperation. Fourth, promote community-based health services to provide more convenient and accessible care, establishing community health service stations to deliver basic medical and nursing services and reduce the burden of travel for disabled elderly. Fifth, establish comprehensive health resource information management systems to monitor and manage resource distribution and utilization, enabling timely identification and resolution of allocation imbalances. Through these integrated measures, regional disparities can be gradually reduced, achieving equitable health resource allocation and improving quality of life for disabled elderly.

This study has several limitations. First, the cross-sectional design provides snapshot data that cannot establish temporal relationships or causality. Second, using 2018 CHARLS data, the variables included in the analysis were limited to questionnaire items and may not fully capture all influencing factors of disability and severity.

Future research should employ retrospective cohort studies to explore long-term disability trends and examine how disability levels change across different regions and time periods to identify impacts of socioeconomic and policy factors. This study provides a scientific basis for developing targeted health management and interventions, helps optimize resource allocation, and informs policy development.

Author Contributions

Liu Ying: statistical analysis, manuscript writing and revision. Jiang Juncheng: data cleaning, data management, manuscript review and commentary. Jing Huiquan: data management, funding support, conceptualization, supervision, and overall guidance, taking full responsibility for the manuscript. All authors approved the final version.

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