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The Impacts of Relative Deprivation on Depression Among Middle-Aged Adults and Older Adults: Evidence From Rural China

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Abstract: This study investigated the impacts of relative deprivation on depression among middle-aged and older adults in rural China, focusing on its variability across different groups. Data were obtained from the National Survey of China Health and Retirement Longitudinal Study. The results indicate that relative deprivation significantly increases the risk of depression. Compared to older adults, middle-aged adults are more susceptible to the effects of relative deprivation, which has a greater impact on their depression. Additionally, relative deprivation worsens depression among middle-aged men, married individuals, those with functional impairments, and those employed in non-farming occupations. Relative deprivation also intensifies depression in older adults who are female, unmarried, functionally independent, or unemployed. These findings support the development of policies on rural income distribution and psychological interventions aimed at reducing depression in rural populations.

Keywords: Depression; relative deprivation; middle-aged adults; older adults; in rural China.

1. Introduction

Depression has been one of the major contributors to the global burden of diseases. In China alone, the all-age prevalence rate of depression per 100,000 rose from 3224.6 to 3990.5 from 1990 to 2017, an increase of 24.7% (Pan et al., 2019). According to research in 2019, the prevalence of depression in China reached 2.1% (Huang et al., 2019). China's population accounts for 17.88% of the world's population while depression accounts for 27.14% of global cases. And depression rate was on the rise in every province of the country, revealing that depression has become a serious disease burden in China (Ren et al., 2020).

Moreover, the World Health Organization (WHO) recently claimed the COVID-19 pandemic triggered a 25% increase in the prevalence of depression worldwide (World Health Organization, 2022). The pandemic has fueled both interest and concern about depression. Due to longer life expectancy and declining fertility rates (Zhang, 2021), China has become one of the countries with the most rapidly-aging populations in the world in just 20 years. As a country with a large population, China should also do its best to take action to reduce depression. And the prevalence of depression in the countryside is significantly higher than that in urban according to the statistics from China Mental Health Survey. Furthermore, rural older adults in China have a higher risk of depression (Fan & Yang, 2022). Therefore, middle-aged adults and older adults are the main groups in rural areas, suggesting that one of the keys is to reduce their depression in rural China.

Substantial evidence has linked lower income to higher depression (Lopes, Kamau & Jaspal, 2018; Hakulinen et al., 2016; Elovainio et al., 2012; Zimmerman & Katon, 2005; Whooley et al., 2002). But these studies focused on revealing the relationship between absolute income and depression (Lopes, Kamau & Jaspal, 2018; Hakulinen et al., 2016; Elovainio et al., 2012; Zimmerman & Katon, 2005; Whooley et al., 2002). However, compared with absolute income, relative income was probably stronger associated with depression (Eibner, Sturm & Gresenz, 2004; Abrams & Grant, 2011). Accordingly, several studies reported that relative income was negatively linked with mental health (Eibner, Sturn & Gresenz, 2004; Blázquez Cuesta & Budría, 2013; Cuesta & Budría, 2015). Relative income implies that there is deprivation. Relative deprivation has been defined as “the difference between an individual’s or community’s income and the income of

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individuals or community in their reference group" (Wagstaff & van, 2000; Qin et al., 2021). Some studies also pointed out that relative deprivation has negative impacts on psychological health. Moreover, the effects revealed significant age, gender, and urban-rural disparities (Lyu & Sun, 2020). Besides, depression is an important negative aspect of mental health. Relative deprivation may importantly affect depression and these impacts are intertwined by gender and region (Ladin, Daniels & Kawachi, 2010; Shi et al., 2023). Some studies explained that income inequality can trigger social comparisons and make people experience an objective disadvantage, leading to a sense of frustration, unfairness, and psychosocial stress (Kawachi, Kennedy & Wilkinson, 1999; Kawachi & Kennedy, 1999; Marmot & Wilkinson, 2001; Kawachi, Subramanian & Almeida-Filho, 2002; Kondo et al., 2015).

Therefore, from the perspective of relative income, this study aims to examine the impacts of relative deprivation on depression among middle-aged adults and older adults in rural China. Meanwhile, a comparative analysis was conducted on the heterogeneity differences between the two groups. In contrast to most existing research conducted in western society, this study focuses on a sample of middle-aged adults and elderly in rural China. Considering different family responsibilities and roles, it is supposed that relative deprivation affects depression differently among middle-aged adults and older adults. Middle-aged adults are in the pressure stage of " undertaking their children’ s education and supporting older adults". The heavy financial burden makes them highly sensitive to income gaps, resulting in a higher risk of depressive symptoms. By contrast, most of older adults in rural areas mainly raise their grandchildren at home. And the effects of relative deprivation on depression are not significant due to lacking the main source of income comparison. The findings of this study have potential policy implications. It provides evidence support for the formulation of rural residents' mental health promotion policies and income gap reduction policies by groups to reduce depression in rural China.

2. Method

2.1 Participants

The data came from the 2015 national survey of China Health and Retirement Longitudinal Study (CHARLS). The survey conducted by the China Social Science Survey Center of Peking University aims to collect a high-quality nationally representative sample of Chinese residents ages 45 and older to serve the needs of scientific research on older adults. The data collection adopted multi-stage stratified PPS sampling. The participants selected for this study were Chinese rural residents aged 45 years and above with rural household registration (hukou). Finally, 3911 rural residents (2029 male, 1882 female) and 293 villages were conducted in the study. Fig. 1 shows the distribution of samples from different provinces in China in this study by retaining samples from rural areas and removing samples with missing or outliers in important variables. The survey area covers most of the provinces in China (271 Anhui, 80 Chongqing, 145 Fujian, 123 Gansu, 218 Guangdong, 103 Guangxi, 74 Guizhou, 165 Hebei, 48 Heilongjiang, 186 Henan, 74 Hubei, 185 Hunan, 250 Jiangsu, 139 Jiangxi, 29 Jilin, 62 Liaoning, 138 Neimenggu, 25 Qinghai, 103 Shaanxi, 318 Shandong, 2 Shanghai, 153 Shanxi, 412 Sichuan, 23 Tianjin, 9 Xinjiang, 310 Yunnan, 166 Zhejiang).

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Fig. 1 The sample distribution

2.2 Measures

2.2.1 Depression

Depression was assessed using a revised version scale based on the Center for Epidemiological Survey-Depression Scale (CES-D) developed by Radloff (1977), a self-report questionnaire consisting of 10 questions with a five-point Likert-type scale (Appendix Table 1). CES-D-10 has proven strong psychometric properties in assessing the severity of depression symptoms and detecting a depression diagnosis (Björgvinsson et al., 2013). It has been also confirmed to have better clinical utility and ease of scoring (Andresen et al., 1994). And it has been widely measured multicultural populations' depression among adolescents (Bradley, Bagnell, & Brannen, 2010), older adults (Irwin, Artin & Oxman, 1999), and older adults (Cheng, Chan & Fung, 2006), showing adequate reliability and construct validity. Responses were made to respond to all the questions with a 4-level score from 0 (< 1 day), 1 (1 ~ 2 days), 2 (3 ~ 4 days), to 3 (5 ~ 7 days), where higher scores represent more severe depression symptoms. The Cronbach's alpha for the scale is 0.786, demonstrating good internal consistency in this study.

2.2.2 Relative deprivation

Relative deprivation in this study was operationalized as the Kakwani Index which was developed based on the Yitzhaki index (Yitzhaki, 1979). Kakwani Index overcomes the deficiency of the Yitzhaki index which did not satisfy the properties of dimensionless and normality in many

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existing studies (Adjaye-Gbewonyo & Kawachi, 2012; Blázquez & Budría, 2013; Cuesta & Budría, 2015), resulting in sensitivity to population size and income distribution. The Kakwani Index estimated with the following formula was examined to assess relative deprivation (Kakwani,1984).

$$KakwaniIndex_i = \frac{1}{n\mu}\sum_{j=i+1}^{n}\left(x_j - x_i\right) \quad (1)$$

Where n is the total sample, x_i is the average household income of the individual i, x_j is the average household income of individual j $(x_j \geq x_i)$, $x_1 \leq x_2 \leq ... \leq x_n$ is the average household income in ascending order, and u is the average household income of the overall sample. Similar to the research by Yoxon et al. (2019), the relative deprivation in this study is defined as individual-level relative deprivation. The study took all people as a reference group. And relative deprivation was calculated by comparing the income gap between the respondent and other individuals with higher average household income in the reference group.

2.3 Statistical Analysis

Statistical analysis in the study was carried out via STATA14.0. We first reported the descriptive statistics of all samples, correlation coefficients, and depression status of middle-aged adults and older adults. Then, ordinary least squares linear regression analysis was used to examine the impacts of relative deprivation on depression among the overall samples, middle-aged adults, and older adults. Lastly, heterogeneity analysis was further performed to compare the differences in the effects of relative deprivation on depression between different groups among middle-aged adults and older adults.

3. Results

The results obtained from the preliminary analysis of all the variables are presented in Table 1. Table 2 reports the relative deprivation and depressive tendencies status of samples by age, and the correlation coefficients between relative deprivation and depression. Overall, almost 38.43% of all the participants have a depressive tendency considering the total score of depression is not less than 10 points. In terms of groups, 35.35% of middle-aged adults have a depression tendency while 39.52% of older adults have a depression tendency in rural China, indicating that older adults have more severe depression symptoms than middle-aged adults. Besides, the scores of relative deprivation among middle-aged adults and older adults are 0.755 and 0.823, respectively. Compared with middle-aged adults, relative deprivation among older adults group was higher, reflecting the larger income gap among older adults in rural China. Moreover, results of the correlation analysis demonstrate a significantly positive association between relative deprivation and depression. Notably, relative deprivation is significantly positively correlated with depression among rural middle-aged adults ($r=0.141$, $p < 0.001$). And a statistically significant positive correlation exists between relative deprivation and depression among rural older adults ($r=0.098$, $p < 0.001$). It suggests that the higher the relative deprivation, the stronger the depression among middle-aged adults and older adults in rural China.

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Table 1. Descriptive statistics of all the variables (N=3911)

Variables	Explanation	Mean	SD
Depression	The higher the total score, the more severe the depressive symptoms	8.914	6.478
Depressive tendency	The total score≥10 (yes=1, no=0)	0.345	0.475
Relative deprivation	The income gap between the respondent and other individuals with higher average household income in the reference group	0.805	0.230
Age	45~97	66.957	9.523
Middle-aged group	45~59	58.674	4.284
Elderly group	≥60	74.167	6.475
Male	Yes=1, no=0	0.519	0.500
Have a spouse	Yes=1, no=0	0.799	0.401
Education			
Illiterate	Yes=1, no=0	0.242	0.429
Primary school	Yes=1, no=0	0.515	0.500
Junior high school	Yes=1, no=0	0.172	0.377
High school or higher	Yes=1, no=0	0.071	0.256
Job-status			
Farming jobs	Yes=1, no=0	0.567	0.496
Non-farming jobs	Yes=1, no=0	0.201	0.400
Unemployment	Yes=1, no=0	0.232	0.422
Disability	Functional limitations in activities in daily living (ADL) or instrumental activities in daily living (IADL) (yes=1, no=0)	0.932	0.252
Health insurance	Yes=1, no=0	0.210	0.407
Number of children		1.000	0.016
Frequency of seeing children	5-level score from 0 (< 7 days), 1 (7~ 15 days), 2 (16 ~ 30 days), 3 (31 ~ 90 days), to 4 (> 90 days)	1.088	1.138

Table 2. Relative deprivation and depressive tendencies of samples by age, and the correlation coefficients between relative deprivation and depression

Variables	All the samples	Middle-aged adults	Older adults
Depressive tendency (%)	38.43	35.35	39.52
Relative deprivation	0.805(0.118^{***})	0.755 (0.141^{***})	0.823 (0.098^{***})
N	3911	1024	2887

Note: *Correlation coefficients and significance of relative deprivation and depression are in parenthesis.*
*** p<0.001, ** p<0.01, * p<0.05

The results of the regression analysis are set out in Table 3. Model (1), model (2), and model (3) demonstrate the impacts of relative deprivation on depression among the overall sample, among middle-aged adults, and among older adults, respectively. As the regression results in model (1), model (2), and model (3), relative deprivation positively affects depression among the overall samples ($\beta = 0.081$, $p < 0.001$), among middle-aged adults ($\beta = 0.077$, $p< 0.05$), and among older adults ($\beta = 0.075$, $p < 0.01$), respectively. There is a significant positive correlation between relative deprivation and depression among middle-aged adults and older adults in rural China, showing that the widening income gap may aggravate depression. Meanwhile, according to the influence effects, the influence impacts of relative deprivation on depression among middle-aged

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adults are higher, indicating that middle-aged adults' depression is more obviously affected by the income gap than older adults'. In addition, individual characteristics affects the relationship between relative deprivation and depression, including gender, marital status, work status, disability, and frequency of seeing a child. For example, the increased frequency of seeing children is strongly associated with lower depression, suggesting that support from family members contributes to fewer depressive symptoms among middle-aged adults and older adults in rural China. Besides, the variance inflation factor (VIF) and mean VIF of all independent variables range from 1.02 to 1.83 (VIF < 10). Further statistical tests results revealed that the models were constructed well.

Considering individual characteristics may affect the relationship between relative deprivation and depression among different groups, including gender, marital status, job status, and disability (Wildman, 2003; Zimmerman & Katon, 2005; Ladin, Daniels & Kawachi, 2010; Lopes, Kamau & Jaspal, 2018; Ren et al., 2020). We further conducted a heterogeneity analysis among middle-aged adults and older adults. Table 4 shows the results of the impacts and heterogeneity of relative deprivation on depression among the middle-aged adults and older adults. The results indicates that relative deprivation exacerbates depression among middle-aged adults who are male ($\beta = 0.085$, $p < 0.05$), married ($\beta = 0.096$, $p < 0.01$), functionally impaired ($\beta = 0.367$, $p < 0.05$), or engaged in non-farming occupations ($\beta = 0.150$, $p < 0.001$). And relative deprivation intensifies depression among older adults who are female ($\beta = 0.114$, $p < 0.01$), without spouses ($\beta = 0.167$, $p < 0.01$), functionally independent ($\beta = 0.063$, $p < 0.05$), or not working ($\beta = 0.148$, $p < 0.001$).

Table 3. The impacts of relative deprivation on depression

Variables	Model (1) All the samples	Model (2) Middle-aged adults	Model (3) older adults
Relative deprivation	0.081***(-0.021)	0.077*(-0.038)	0.075**(-0.026)
Male	-0.255***(-0.034)	-0.345***(-0.059)	-0.249***(-0.042)
Age	-0.068**(-0.021)	0.083(-0.136)	-0.154***(-0.029)
Have a spouse (marital status)	-0.271***(-0.045)	-0.477**(-0.146)	-0.260***(-0.047)
Education (Illiterate as the reference group)			
Primary school	-0.017(-0.043)	-0.114(-0.109)	0.005(-0.047)
Junior high school	-0.174**(-0.054)	-0.208(-0.115)	-0.193**(-0.064)
High school or higher	-0.258***(-0.063)	-0.301*(-0.136)	-0.295***(-0.073)
Job status (farming jobs as the reference group)			
Non-farming jobs	-0.136***(-0.038)	-0.127(-0.066)	-0.126**(-0.047)
Not working	-0.074(-0.042)	-0.098(-0.11)	-0.043(-0.045)
Health insurance	-0.051(-0.063)	0.054(-0.118)	-0.103(-0.073)
Disability	0.570***(-0.044)	0.921***(-0.134)	0.519***(-0.046)
Number of children	-0.017(-0.009)	-	-0.025*(-0.01)
How often to see children	0.063***(-0.016)	0.023(-0.03)	0.076***(-0.018)
Constant	0.371***(-0.077)	0.611**(-0.233)	0.474***(-0.089)
N	3911	1024	2887
R^2	0.138	0.172	0.135

Note: Robust standard errors in parentheses. *** p<0.001, ** p<0.01, * p<0.05

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Table 4. Results of heterogeneous analysis of the impacts of relative deprivation on depression

Groups	Variables	Gender		Marital status		Disability		Job-status		
		Male	Female	Have a spouse	Without spouses	Functionally impaired	Functionally independent	Farming jobs	Non-farming jobs	Not working
Middle-aged adults	Relative deprivation	0.085* (0.042)	0.081 (0.058)	0.096** (0.036)	0.170 (0.160)	0.367* (0.164)	0.052 (0.034)	0.036 (0.057)	0.150*** (0.044)	0.029 (0.142)
	Control variables	control	control	control	control	control	control	control	control	control
	N	425	599	962	62	89	935	593	334	97
	R^2	0.201	0.094	0.156	0.320	0.178	0.104	0.118	0.226	0.263
Older adults	Relative deprivation	0.056* (0.030)	0.114** (0.048)	0.053* (0.028)	0.167** (0.064)	0.118 (0.065)	0.063* (0.028)	0.055 (0.039)	0.045 (0.049)	0.148*** (0.046)
	Control variables	control	control	control	control	control	control	control	control	control
	N	1604	1283	2162	725	733	2154	1626	450	811
	R^2	0.082	0.101	0.115	0.115	0.074	0.083	0.131	0.095	0.143

Note: Robust standard errors in parentheses. *** p<0.001, ** p<0.01, * p<0.05

4. Discussion

Using cross-sectional data, this study finds that almost 38.43% of all the participants have a depressive tendency among middle-aged adults and older adults in rural China. And 35.35% of middle-aged adults have a depression tendency while 39.52% of older adults have a depression tendency in rural China. With the deepening of China's aging population, depression may become increasingly severe among middle-aged adults and older adults in rural China, predicting that rural development in China will focus on improving mental health and reducing the middle-aged adults' and older adults' depressive symptoms.

This study finds that higher relative deprivation is closely associated with higher depression among middle-aged adults and older adults in rural China, especially among middle-aged adults. However, the findings are slightly different from the study by Wildman (2003), reporting that higher relative deprivation (measured by Kakwani Index) exacerbated negative mental health among women but not among men. Yun, Guoqiang & Yunbo (2019) agreed with the findings in this study, supporting a positive relationship between relative deprivation (measured by Kakwani Index) and depression among adult residents in rural China. The findings are also consistent with previous studies on populations in different countries, including Taiwanese (Kuo & Chiang, 2013), Japanese (Gero et al., 2017), American adults except older adults (Eibner, Sturn, & Gresenz, 2004), and German residents (including young people, middle-aged adults, and older adults) (Cuesta & Budria, 2015), although relative deprivation was measured by Yitzhaki index. These studies confirm that increased relative deprivation was positively associated with a higher risk of depression.

This study also finds that the impacts of relative deprivation on depression had group differences through heterogeneity analysis. Among all samples, the positive impacts of relative deprivation on depression are exacerbated by individual characteristics. Furthermore, relative deprivation exacerbates depression among those who are male, married, functionally impaired, or engaged in non-farming occupations. And relative deprivation intensifies depression among older adults who are female, without spouses, functionally independent, or not working. Especially in terms of gender, the findings in gender are consistent with Gero et al. (2017) that females were more susceptible to the positive effects of relative deprivation on depression among older adults. However, several studies held different views. According to Blázquez & Budría (2013), the effects

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of relative deprivation on depression were statistically significant among males but not among females. However, Cuesta & Budría (2015) supported that the negative effects of relative deprivation on mental health were higher among males (51.9%) rather than among females (36.6%).

The possible explanations for the findings are as follows: Among middle-aged adults, on one hand, men are in the pressure stage of "undertaking their children’s education and supporting older adults". And their heavier financial burden makes them more sensitive to income gaps, causing a higher risk of depressive symptoms. On the other hand, the differences in traditional Chinese social roles in which “men are responsible for making money outside and women are responsible for taking care of the whole family inside”, to a certain extent, possibly help females reduce the sensitivity to the pressure of family economic burden and income gaps. There is a greater chance of quarrels or conflicts with the spouse due to psychological stress. Disability has been confirmed as a risk factor for depression (Turner & Noh, 1988). Those who are engaged in non-farming jobs are more likely to be migrant workers. And they have more opportunities to meet people from different income groups, resulting in a higher likelihood of negative emotions due to income disadvantage. However, among older adults, compared with the group with a spouse, relative deprivation had a more significant positive impact on depression in the group without spouses. Loneliness without companionship and care from a spouse is a risk factor for depressive symptoms. And the perception of idleness among those who are functionally intact but unemployed can probably exacerbate the positive impacts of relative deprivation on depression.

This study focuses on the impact of relative income on depression among middle-aged adults and older adults in rural China and compares heterogeneous differences of relative deprivation on depression between the two groups. The paper highlights the importance of reducing income inequality in reducing depression. Furthermore, it also emphasizes the importance of taking into account differences in individual characteristics when formulating and implementing rural policies that narrow the income gap between individuals, suggesting that policies should be formulated and implemented in a targeted manner based on group characteristics. For example, among rural middle-aged adults in China, disabled people should be given special attention and more financial and psychological assistance. Among rural older adults in China, those without spouses should be given more attention and social care.

The reader should bear in mind that the study is based on cross-sectional data. Future studies could focus on tracking specific populations. Besides, we used an objective evaluation method to assess relative deprivation, suggesting that future research could add subjective assessment methods and other indexes to measure relative deprivation.

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