

## Preplanned Studies

## Driving Factors for Subjective Relative Deprivation Alleviating Among Middle-Aged and Older Adults with Disabilities — China, 2023

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### Summary

#### What is already known about this topic?

Previous research has identified a link between economic deprivation, internet usage, and subjective relative deprivation in the general populace. However, few studies have explored the mediating role of internet usage in the relationship between economic deprivation and subjective relative deprivation, particularly in relation to middle-aged and older adults with disabilities.

#### What is added by this report?

This research examines the circumstances of middle-aged and older Chinese adults living with disabilities, using the most recent data available. The study uncovers both absolute and relative economic deprivation as key factors significantly correlated with subjective relative deprivation. Additionally, it emphasizes the mediating role of internet usage within this specific relationship.

#### What are the implications for public health practice?

The connection between subjective relative deprivation and adverse physical and mental health outcomes has been firmly established, which underscores the critical need to address economic deprivation and enhance internet accessibility. Implementing such strategies is essential for mitigating the effects of subjective relative deprivation within this particular demographic.

Subjective relative deprivation (SRD) represents an individual's perceptions and feelings of inequality and disadvantage in comparison to a referential group (1). Since its conceptualization (2), SRD has surged as a pivotal research field across various disciplines — ranging from psychology and sociology to political science and economics — covering all stages of the human life cycle (3). With the progression of aging, the enhancement of subjective well-being for the elderly and the reduction of SRD have become critical

areas of concern for researchers, service providers, and policymakers. However, the digital divide's emergence, particularly among older adults, has led to a discrepancy between those with and without disabilities. Past research indicates that older adults with disabilities are less frequent internet users and benefit from it less than their non-disabled counterparts.

Individuals with disabilities, including those in their later years, have demonstrated lower self-rated health and subjective well-being. This is contrary to the traditional definition of successful aging outlined by the MacArthur model, which includes a decreased risk of disability, heightened physical and cognitive capacity, and engaging in social activities (4). Therefore, this study aims to examine the correlation between objective and subjective relative deprivation, identifying key factors that may mitigate subjective relative deprivation in middle-aged and older adults suffering from disabilities in China. The study proposes two hypotheses: first, that economic objective relative deprivation has a direct influence on subjective relative deprivation within this demographic; and second, that internet usage among these adults acts as a mediating factor, impacting the extent and course of this direct influence.

Data for this study was extracted from the National Sample Survey on Subjective Perceptions and Evaluation of Persons with Disabilities' Protection and Development. To identify potential subjects, we used a proportional stratification and a multi-stage random sampling method, targeting those listed in the National Basic Database of People with Disabilities (NBDPD) who were in possession of an identification card provided by the China Disabled Persons' Federation (CDPF). From March to June 2023, trained interviewers from CDPF conducted surveys on selected individuals. In instances where the person with a disability was unable to participate, a cohabitating family member filled out the questionnaire on their

behalf.

The survey included objective and subjective questions related to economic status, employment, social security, education, usage of rehabilitation services, accessibility, and internet usage. The construction of the Personal Relative Deprivation Scale of People with Disabilities (PRDS-PwDs) was based on existing research and incorporated into the survey (Supplementary Table S1, available in <https://weekly.chinacdc.cn/>)(1,5). Through this process, we were able to interview 9,104 individuals with disabilities and gather 5,073 relevant responses, with 3,876 of the respondents aged 45 and above. The NBDPD, a continually updated database, was utilized due to its accuracy in determining eligibility and types of social security and benefits for people with disabilities.

The analysis conducted after addressing missing responses included 3,870 participants, who had an average age of 63.87 years [standard deviation (SD)=10.93], and a median age of 64 years. Male participants comprised 56.3% of the sample, with 30.5% residing in urban areas, and the majority identified as individuals with physical disabilities (58.1%). More details can be found in Supplementary Table S2 (available in <https://weekly.chinacdc.cn/>).

This study used several indices to assess deprivation: the SRD index for subjective relative deprivation, per capita annual household income for absolute economic deprivation, and the Yitzhaki index for relative economic deprivation (6). Based on relevant literature and theoretical studies, a 10-item scale was adapted, designed to identify the cognitive-emotional dual-dimensional structure of relative deprivation among individuals with disabilities (5). The scale included variables such as family economic income status, medical rehabilitation, public education, vocational training, and accessibility. A 5-point Likert scoring method was used, allowing scores from 10 to 50. A higher total score indicated a greater level of subjective relative deprivation. Additionally, a higher score on the Yitzhaki index suggested a higher level of relative economic deprivation.

Within the confines of internet utilization, the current study employed two indices — the frequency of internet use and the dimensions of internet use — to delineate the patterns of internet usage. The frequency of internet use was gauged via two questions, namely: “How frequently do you utilize the internet on your computer?” and “How frequently do you engage with the internet via your mobile device?” Response

options provided were “never,” “rarely,” “sometimes,” “often,” and “very frequently”, with each corresponding to a value between 1 and 5. By adding the scores of both questions, we derived an Internet Frequency Index which ranged from 2 (minimal internet usage) to 10 (extensive internet usage).

The dimensions of internet use were determined by enquiring if the participants deployed the internet for specific activities such as accessing news, online shopping, mobile payments, telemedicine, social interaction, relaxation and entertainment, seeking employment information or engaging in work-related activities, among others. Participants were to respond with either a “yes” (equivalent to 1 point) or a “no” (equivalent to 0 points) for each activity. The aggregate of these points from all the activities gave rise to the internet use dimension index, which ranges from 0 to 8 points.

This study employed the ordinary least squares (OLS) linear regression model to examine the correlations between economic deprivation, subjective relative deprivation, and internet use. Following this, the Sobel mediation effect detection method (7) was utilized to investigate the potential intermediary role of internet usage in the relationship between economic deprivation and subjective relative deprivation. All statistical analyses were conducted using STATA software (version 16; StataCorp. LLC, USA), with  $P < 0.05$  considered statistically significant.

The study results revealed significant relationships between both absolute and relative economic deprivation and subjective relative deprivation, after controlling for additional variables (Table 1). An increase in the annual per capita household income was associated with a decrease in the subjective relative deprivation index (Coefficient=0.163,  $P=0.009$ ), and a high Yitzhaki index corresponded to a lower subjective relative deprivation index (Coefficient=0.687,  $P=0.003$ ). The Yitzhaki index assessed relative economic deprivation through a horizontal comparison within the reference group which comprised family members, friends, neighbors, work colleagues, and others comparable to the interviewees with disabilities (8). Yet, this type of horizontal relative economic deprivation did not have a noticeable mitigating impact on the subjective relative deprivation experienced by individuals with disabilities. Additional details are provided in Table 1.

Further investigation, as outlined in Table 2, examined the complex relationship between both absolute and relative economic deprivation and

TABLE 1. Relationship between economic deprivation and perceived relative deprivation among middle-aged and elderly individuals with disabilities, China, 2023.

Variables	Model 1	Model 2
	Coefficient (95% CI)	Coefficient (95% CI)
Annual per capita household income (log)	-0.234 (-0.285, -0.040)*	-
Yitzhaki index	-	-0.687 (-1.146, -0.229)*
Control variables	Yes	Yes

Note: The control variables in this study include age, gender, type of disability, degree of disability, living status (alone or with others), presence of other individuals with disabilities in the household, employment status, accessibility of the community, place of residence, and region.

Abbreviation: CI=confidence interval.

\*  $P \leq 0.01$ .

TABLE 2. Association between economic deprivation and internet use among middle-aged and elderly individuals with disabilities, China, 2023.

Variables	Frequency of internet use		Dimension of internet use	
	Coefficient (95% CI)		Coefficient (95% CI)	
	Model 3	Model 4	Model 5	Model 6
Annual per capita household income (log)	0.243* (0.197, 0.289)	-	0.164* (0.126, 0.202)	-
Yitzhaki index	-	-0.593* (-0.767, -0.419)	-	-0.309* (-0.451, -0.166)
Control variables	Yes	Yes	Yes	Yes

Note: The control variables in this study include age, gender, type of disability, degree of disability, living status (alone or with others), presence of other individuals with disabilities in the household, employment status, accessibility of the community, place of residence, and region.

Abbreviation: CI=confidence interval.

\*  $P \leq 0.001$ .

internet usage patterns among middle-aged and older adults with disabilities. Controlling for other variables, an increase in per capita annual household income was positively correlated with both the frequency (Coefficient=0.243,  $P < 0.001$ ) and scope (Coefficient=0.164,  $P < 0.001$ ) of internet usage. Conversely, a rise in the Yitzhaki index indicated a negative relationship with both the frequency (Coefficient=-0.593,  $P < 0.001$ ) and scope (Coefficient=-0.309,  $P < 0.001$ ) of internet usage. Detailed findings can be found in Table 2.

Using the Sobel mediation effect measure for analysis, Table 3 presents the mediating role of internet usage in middle-aged and older adults with disabilities. The findings highlighted that both absolute and relative economic deprivation directly and indirectly impacted the subjective relative deprivation experienced by this group. An increase in absolute income mitigated subjective relative deprivation by promoting more frequent and broader use of the internet. With respect to relative economic deprivation, the mediation mechanism showed complexity. The Yitzhaki index served as a direct reducing factor for subjective relative deprivation. However, significant relative economic deprivation reduced both the frequency and breadth of internet

use, indirectly exacerbating the issue of subjective relative deprivation. For a detailed examination, please refer to Table 3.

## DISCUSSION

The findings of this study highlight an important discovery: addressing economic deprivation directly can minimize the relative subjective deprivation experienced by middle-aged and older adults with disabilities. This conclusion aligns well with previous research in this field (8). However, an unexpected deviation emerges regarding relative economic deprivation, which demonstrates a reverse correlation with subjective relative deprivation in this demographic, contradicting established paradigms. This discrepancy may be due to the unique measurement scale used in this study, which focused on longitudinal rather than more common horizontal comparisons. Some studies have relied on the latter, where feelings of relative deprivation predominantly originate from external reference groups and lack a direct connection to personal interests (9). China's rapid social and economic development, marked by an increase in income levels for people with disabilities, education, and job opportunities, as well as

TABLE 3. Analysis of the mediating effects of internet use on subjective relative deprivation among middle-aged and elderly individuals with disabilities, China, 2023.

Independent variables	Mediating variables	Dependent variables: subjective relative deprivation	
Annual per capita household income (log)	Frequency of internet use	Total effect	-0.163*
		Direct effect	-0.046
		Indirect effect	-0.116 <sup>†</sup>
		Indirect effect/total effect	71.5%
		Control variables	Yes
	Dimension of internet use	Total effect	-0.163*
		Direct effect	-0.055
		Indirect effect	-0.107 <sup>†</sup>
		Indirect effect/Total effect	66.0%
		Control variables	Yes
Yitzhaki index	Frequency of internet use	Total effect	-0.687 <sup>†</sup>
		Direct effect	-0.856 <sup>†</sup>
		Indirect effect	0.320 <sup>†</sup>
		Indirect effect/total effect	43.4%
		Control variables	Yes
	Dimension of internet use	Total effect	-0.687*
		Direct effect	-0.895 <sup>†</sup>
		Indirect effect	0.208 <sup>†</sup>
		Indirect effect/total effect	30.3%
		Control variables	Yes

Note: The control variables in this study include age, gender, type of disability, degree of disability, living status (alone or with others), presence of other individuals with disabilities in the household, employment status, accessibility of the community, place of residence, and region.

\*  $P \leq 0.01$ .

<sup>†</sup>  $P \leq 0.001$ .

improvements in social security infrastructure, characterizes the current scenario. As a result, individuals with disabilities seem to be buffered against negative feelings when compared to their counterparts. Accordingly, the negative correlation between their relative economic and subjective relative deprivation is a salient feature, straying from the typical positive association.

This study revealed a key finding: both absolute and relative economic deprivation indirectly influence subjective relative deprivation by shaping the frequency and dimension of internet usage. This observation aligns with the majority of existing research (9–10). Importantly, increased frequency and dimension of internet usage have been demonstrated to alleviate subjective relative deprivation among individuals with disabilities, serving as a mediator in the complex relationship between economic deprivation and subjective relative deprivation.

There is a clear disparity between those with disabilities and those without in terms of internet

accessibility and the use of information and communication technologies (ICTs) (10). This gap is more pronounced for older adults living with disabilities, who often face compounded challenges with digital access and information. This digital divide, exacerbated by relative economic deprivation, highlights a critical area that requires attention to improve the well-being of this population. It is essential to recognize that quality internet use can significantly contribute to the enhancement of life satisfaction and reduction of negative cognitive and emotional experiences among individuals with disabilities (11). This study underscores the importance of accessible ICTs in enabling individuals with disabilities to fully exercise their basic rights and mitigate subjective feelings of relative deprivation. Based on these findings, a strong recommendation is proposed: the development of policies promoting the use and advancement of digital technologies for individuals with disabilities. In summary, this study emphasizes the crucial importance of addressing

economic disparities and internet accessibility as key strategies in reducing subjective relative deprivation among middle-aged and older adults living with disabilities.

Despite these inherent limitations in our study, it's important to highlight them. Primarily, our use of cross-sectional data restricts us from establishing definite causal relationships. Additionally, the exclusion of specific control variables might potentially bias our estimations. Despite these challenges, the main trends and findings from this study remain consistently robust. Further evidence is crucial to deepen our understanding of the complex interconnections between economic deprivation, internet usage, and subjective relative deprivation among this particular demographic.

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## SUPPLEMENTARY MATERIALS

### Supplementary Information on Study Variables and Participant Characteristics

The PRDS-PwDs was utilized to measure SRD. A thorough review of existing literature and relevant theoretical studies confirmed the cognitive-emotional dual-dimensional structure of relative deprivation among individuals with disabilities used in the scale. Moreover, it also defined general sources of relative deprivation within the overall population. Interviews were conducted with several individuals with disabilities to understand their focal concerns in life. The scale then centered on the outcomes of a longitudinal comparison, considering both cognitive and emotional experiences of relative deprivation among individuals with disabilities during periods of socio-economic progress. Factors taken into account included family economic status, access to medical rehabilitation, public education, vocational training, and a barrier-free environment (Supplementary Table S1). The scale consisted of 10 items, using a Likert 5-point scoring system. The total score potential ranged from 10 to 50, where a higher score indicated a higher degree of subjective relative deprivation experienced by the participants.

In this study, economic deprivation was categorized into two divisions: absolute and relative economic deprivation. Absolute economic deprivation was assessed based on the per capita annual household income of individuals with disabilities. It was observed that an increase in the per capita annual household income corresponded to a decreased intensity of absolute income deprivation.

$$\text{per capita annual household income}_i = \frac{\text{household annual income}_i}{\text{number of family members}_i}$$

The measurement of relative economic deprivation was grounded on the assessment of absolute economic deprivation. The construction of the relative economic deprivation variable involved discerning the extent of social comparisons. It was noted that individuals were prone to make upward comparisons, essentially comparing themselves to those with higher incomes, leading to the subjective experience of relative deprivation when others received higher incomes. The Yitzhaki index (was utilized to quantify relative deprivation in income. An increased Yitzhaki index indicated a higher level of relative economic deprivation experienced by an individual.

SUPPLEMENTARY TABLE S1. The personal relative deprivation scale for individuals with disabilities.

Dimension	Cognition	Emotion
Family income status	Do you think you are better off financially today than you were before you were 18? 1. Greatly improved 2. Partly improvement 3. No change 4. Partly declined 5. Significantly declined	How would you evaluate your current level of satisfaction with your family income in comparison to the past? 1. Very satisfied 2. Satisfied 3. Average 4. Not satisfied 5. Very dissatisfied
Medicine & rehabilitation	To what extent would you say that the financial strain of medical rehabilitation has affected your family compared to the past? 1. Very light or no 2. Light 3. Average 4. Heavy 5. Very Heavy	How does your satisfaction with the rehabilitation services you have used compare to previous experiences? 1. Very satisfied 2. Satisfied 3. Average 4. Not satisfied 5. Very dissatisfied
Public education	Does the prevailing educational system for individuals with disabilities represent an improvement upon historical standards? 1. Very fair 2. Fair 3. Average 4. Unfair 5. Very unfair	How would you compare your level of satisfaction with the current state of education for individuals with disabilities — including factors such as school environment, teaching staff, and curriculum content — to that of the past? 1. Very satisfied 2. Satisfied 3. Average 4. Not satisfied 5. Very dissatisfied
Vocational training	Is the present vocational skills training more impactful on employment as opposed to the methods used in the past? 1. Very helpful 2. Helpful 3. Average 4. Unhelpful 5. Very unhelpful	How does your level of satisfaction with your current vocational skills training compare to previous experiences? 1. Very satisfied 2. Satisfied 3. Average 4. Not satisfied 5. Very dissatisfied
Barrier-free environment	Does the accessibility improvements in your current community adequately compare to those in your past community? 1. Very sufficient 2. Sufficient 3. Average 4. Insufficient 5. Very insufficient	How would you evaluate the current improvements in accessibility within your community in comparison to the past? 1. Very satisfied 2. Satisfied 3. Average 4. Not satisfied 5. Very dissatisfied

SUPPLEMENTARY TABLE S2. Characteristics of the participants included in the study (N=3,870).

Variables	Mean (Frequency)	SD (%)	Median	Minimum	Maximum
Dependent Variables					
Subjective RD Index	25.096	4.333	26	10	40
Independent Variables					
Annual household income per capita (CNY)	16520.000	16442.110	11706.5	0	223,949
Yitzhaki index	0.500	0.291	0.5	0	1
Mediating variables					
Internet use frequency index	3.224	1.781	2	2	10
Internet use dimension index	1.059	1.457	0	0	7
Control variables					
Gender					
Male	2,179	56.3			
Female	1,691	43.7			
Age (year)	63.869	10.931	64	45	100
Type of disability					
Visual	434	11.2			
Hearing	354	9.2			
Speech	53	1.4			
Physical	2,249	58.1			
Intellectual	224	5.8			
Mental	384	9.9			
Multiple	172	4.4			
Level of disability					
Level I	452	11.7			
Level II	1,258	32.5			
Level III	955	24.7			
Level IV	1,205	31.1			
Living alone or not					
Yes	735	19.0			
No	3,135	81.0			
Presence of other disabled persons in the family					
Yes	420	10.9			
No	3,450	89.2			
Employment status					
Yes	967	25.0			
No	2,903	75.0			
Community accessibility					
Yes	2,719	70.3			
No	1,151	29.7			
Residence					
Rural	2,688	69.5			
Urban	1,182	30.5			
Region					
East	1,799	48.2			
Middle	877	23.5			
West	788	21.1			
Northeast	266	7.1			

Abbreviation: SD=standard deviation.

For a person  $i$  with income  $y_i$  who is part of a reference group with  $N$  people, Yitzhaki index is given as:

$$\text{Yitzhaki index}_i = \frac{1}{N} \sum (y_j - y_i), \forall y_j > y_i$$

Where the amount of Yitzhaki index <sub>$i$</sub>  for individual  $i$  is the sum of differences in incomes between individual  $i$  and the  $j$  individuals who have incomes higher than individual  $i$ . The summation  $\sum (y_j - y_i)$  is divided by the number of people in the reference group,  $N$ , making the measure invariant to the size of the reference group.  $\forall y_j > y_i$  represents any individual  $j$  whose income exceeds individual  $i$ .