

RESEARCH ARTICLE

Unveiling health disparities and assessing well-being of older adults in China's aging society: The socioeconomic nexus

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Abstract

With China's population aging rapidly, the challenge of preserving and enhancing the health of its older citizens has gained paramount importance. Leveraging data from the fourth wave of the China Health and Retirement Longitudinal Study, this study examines the relationship between socioeconomic status and well-being of older adults in the context of China's evolving demographic landscape. Empirical analysis reveals compelling statistical evidence that underscores the significant influence of socioeconomic status on the health outcomes of older adults. Notably, socioeconomic factors such as education level, place of residence, household registration (*hukou* [户口]) type, and Communist Party of China membership significantly affect the mental and cognitive well-being of older adults, with a more pronounced impact on mental health. These findings emphasize the need for targeted policies to address disparities and promote holistic well-being as China grapples with an aging population.

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1. Introduction

China's accession to the World Trade Organization in 2001 marked a watershed moment in its economic history, propelling the nation into the global limelight as a manufacturing giant. The influx of foreign direct investment played an instrumental role in expediting China's journey toward globalization. By 2009, China's total economic output had outstripped that of Japan, solidifying its position as the world's second-largest economy. However, this impressive economic growth, averaging 8% annually over three decades, encountered an abrupt interruption with the advent of the 2019 pandemic.

Concurrently, as of 2021, the proportion of China's population aged 65 and above reached 14.2% of its total populace. The year 2022 witnessed a historic turning point, as China experienced its first population decline in 61 years, with a reduction of 850 thousand individuals. The demographic challenges have garnered worldwide attention, prompting the Chinese government to acknowledge the pressing issue of population aging.

The repeal of the 36-year-old one-child policy in 2014 resulted in a significant upswing in births. In 2016, China recorded a record high of 17.86 million births, the

highest since 2000. Nevertheless, by 2022, the number of births had sharply declined to 9.56 million, nearly halving in less than a decade since the policy change (Figure 1). This precipitous drop in newborns within such a brief timeframe poses a substantial threat to the stability of the long-term demographic structure, with far-reaching implications for future government policies and even industrial restructuring.

Population aging is not solely a concern for developed nations; it is gradually becoming a global reality. This trend is rooted in advancements in medical standards following economic development, a decline in infant mortality rates, and a substantial increase in life expectancy, resulting in a growing older people population. The primary driver of population aging is the rapid decline in the total fertility rate, leading to an exacerbation of the proportion of old-age individuals relative to the total population. The pace of this demographic transition varies from one country to another (Bloom & Williamson, 1998; Lee & Mason, 2010).

In contrast to other nations, China faces particularly acute challenges of population aging due to previous policies of government. The implementation of strict family planning during the early stages of economic development led to an abrupt drop in birth rates (Cai, 2010; Jiang *et al.*, 2023). Furthermore, China experienced a significantly shorter timeframe for fertility rate decline relative to economic development compared to developed nations, and even shorter than East Asian countries such as Japan and South Korea, which embarked on their economic development post-World War II. Wu *et al.* (1991) argued that China's population aging is primarily due to the rapid decline in the birth population, resulting in the shortening of the population pyramid's base.

According to development economics, a country's population usually matches its level of social and economic

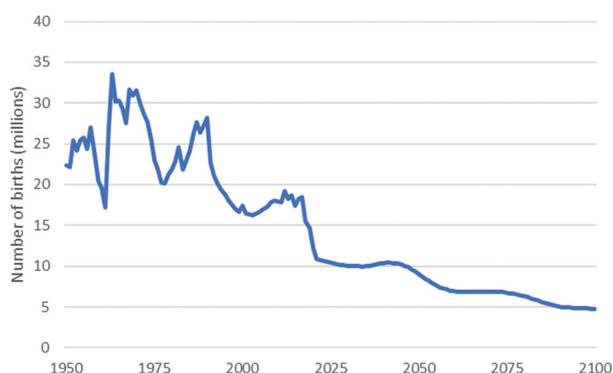


Figure 1. Annual number of births in China
Source: United Nation (2022), World Population Prospects.

development. However, in the pursuit of economic growth, the Chinese government implemented the one-child policy to intervene in fertility for a prolonged period (1979 – 2015), causing the birth rate to decline earlier and more rapidly than in any other country. At the same time, advancements in China's public health system and the adoption of medical treatments from abroad have reduced the infant mortality rate, hastening the demographic transition process. This acceleration has greatly exceeded the corresponding level of economic development in contemporary society, and insufficient wealth accumulation has led to the problem of "getting old before getting rich." Consequently, households in China lack sufficient time to accumulate enough wealth to support retired older ages members, and the social security system is inadequate to meet the medical and care needs of the large older-aged population.

A clear observation from Figure 2 is the continuous reduction in the base of China's population pyramid since 1980, signifying a substantial decrease in the proportion of children in a short span, while the corresponding proportion of the older adults population has witnessed rapid growth. This intricate interplay between economic development and demographic shifts in China underscores the need for a comprehensive analysis of their complex relationship and their implications for China's future trajectory.

Over the past three decades, China's economy has witnessed significant growth, resulting in soaring housing prices and a rapid increase in the cost of raising children. At present, it has become challenging for ordinary middle-class families to afford the expenses associated with raising a second child. The high cost of marriage and parenting, coupled with the high unemployment rate among the young population (16 – 24) (Figure 3), has created a situation where individuals of working age struggle to marry and are hesitant to start families. Despite the Chinese government's announcement in 2021 of a new population policy allowing three children per couple, there is little interest among the younger generation. Birth rates in 2022 fell below 10 million, and based on marriage registration figures from that year, it is predicted that births in 2023 may drop below 8 million.

Since the outbreak of the pandemic, economic downturns, coupled with a 3-year zero-COVID policy, have heightened pessimism among most people regarding the future of the Chinese economy. Therefore, in the short term, reversing the declining birth rate trend proves difficult. Moreover, data from the National Bureau of Statistics of China indicate that in the next 15 years, from 2023, approximately 25 million baby boomers (born 1962 – 1976) will retire annually, exiting the labor market. If the current retirement policy (60 years old for men and 55 years old for women) remains unchanged, a substantial labor force shortage will loom in the future.

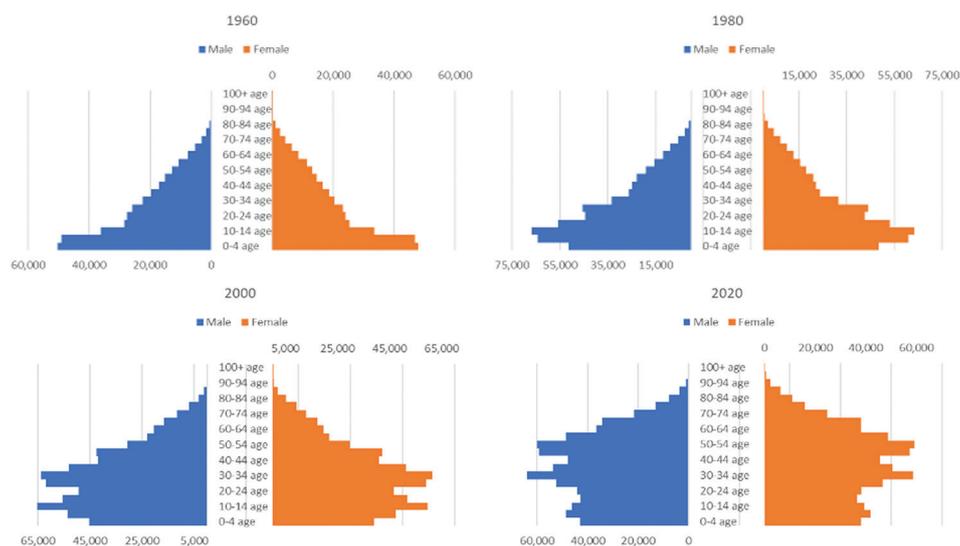


Figure 2. Population pyramids of China (1960, 1980, 2000, 2020)
Source: United Nation (2022), World Population Prospects.

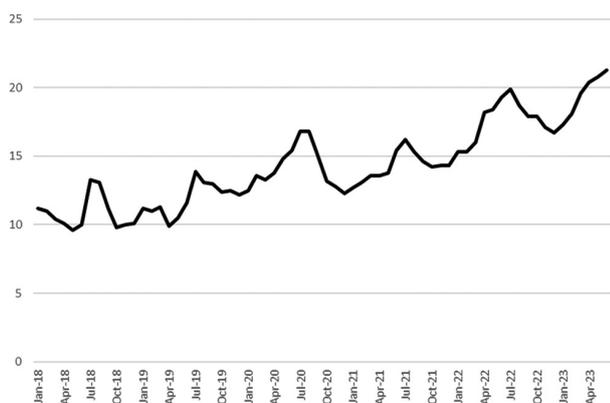


Figure 3. The urban unemployment rate of the population aged from 16 to 24 (%)
Source: National Bureau of Statistics of China (2023).

The rapidly rising dependency ratio among the old-age population and declining public support ratio (Figure 4) will not only profoundly impact China’s economic growth but also put great pressure on the fragile social welfare system and scarce public health-care resources (Lee & Mason, 2011; United Nations, 2013). Government forecasts for medical and health-care financial burdens usually depend on the health indicators of older persons. Therefore, amid rapid population aging, prioritizing the health status of the old-age becomes paramount. In addition to health conditions naturally deteriorating with age, many studies have indicated that socioeconomic status significantly affects the health outcomes of the older adults. Therefore, this study aims to explore the influence of socioeconomic status on the health of the older adults in China. The contributions of this study are summarized as follows.

First, we address the health status of the older-aged from three different perspectives: physical health, mental health, and cognitive health. Previous studies primarily focused on the physical and mental health of the older people. However, given advancements in medical care and increased life expectancy, dementia has emerged as a significant concern among the older ages. Therefore, we introduce cognitive health as an additional indicator of health and examine the relationship between these three aspects of old-age health. Our findings reveal that the physical health of the old-age affects their mental health, and both physical and mental health have implications for cognitive health.

Second, to capture the unique characteristics of Chinese society, we incorporate household registration (*hukou* [户口]) and political party membership as two explanatory variables in our regression model to reflect individuals’ socioeconomic status. We find that, compared to traditional measures such as education level and place of residence, household registration type and party membership not only significantly represent the socioeconomic status of the Chinese populace but also exert a longer cumulative effect on the health status of the older people. These features specific to Chinese society may exacerbate health disparities among the older ages.

The remainder of this paper is structured as follows: Section 2 reviews the literature on the relationship between health and socioeconomic status; Section 3 introduces the data used in this study and provides a statistical description of the variables; Section 4 presents the empirical results and summarizes the findings of this study; finally, in Section 5, we draw conclusions regarding China’s future as a super-aged society.

1.1. Health of older adults and their socioeconomic status in China

Over the past 30 years, China has boasted an abundant and relatively inexpensive labor force, attracting foreign capital and achieving remarkable economic prosperity with an average annual growth rate of 8%. However, a notable “side effect” of this economic development, combined with strict population policies, is the shrinking of family sizes and the transformation of family structures into what is known as the 4-2-1 family model that consisting of four older persons, two middle-aged persons, and only one child. In recent years, a substantial portion of the labor force has started to retire, placing a heavy burden on one-child families to support the older people. The traditional intergenerational support model of the family is no longer suitable for China’s modern society due to industrialization and urbanization. Furthermore, the slow construction of the social security system in the rapidly aging society, coupled with low and unequal social welfare coverage, struggles to meet the demands of the large old-age population for medical resources and long-term care. Jiang & Sanchez-Barricarte (2011) figure out that as the proportion of the older-aged is projected to rapidly increase to 25% by 2050, according to UN projections, the 4-2-1 family structure could strain the social security system. Concerns regarding the difficult post-retirement live of older persons weigh not only on the older-aged individuals themselves and their families but also on society as a whole, fostering feelings of stress and helplessness about the uncertain future.

Because physical abilities for daily activities decline with age that is easier for the older adults to fall into an unhealthy state (Harman, 1981; McAuley *et al.*, 2000; Milanović *et al.*, 2013). The ability of the older ages to care for themselves in daily life is an important criterion for determining their quality of life. Only a healthy and prolonged life can guarantee a high quality of life. If older adults lose the ability to care for themselves, they not only experience personal discomfort but also impose financial burdens on their families. Moreover, a rapid increase in disabled or demented older ages could potentially collapse the social security system. Therefore, maintaining the health of the older people not only preserves their quality of life but also minimizes their dependence on family and social care systems, thereby reducing the demand for medical and health-care resources. Moreover, healthy older adults can activity participate in family and societal activities, helping to address the labor gap in an aging society. Consequently, the health status of the old-age is the key to mitigate the risk associated with an aging society. Addressing these risks can eliminate the potential financial threats posed by the unexpected future of a super-aging society. Therefore, the health of the older people emerges as one of the important issues in Chinese society.

Health, as a relatively abstract concept, proves challenging to measure using a single indicator. Instead, a comprehensive assessment requires consideration of multiple dimensions. Within the declared Constitution of the World Health Organization (WHO), health is defined as a state of complete physical, mental, and social well-being, rather than merely the absence of disease or infirmity – a definition staunchly upheld by the international health agency to this day (United Nations, 1956). In this study, based on the WHO’s definition of health, we aim to evaluate the health status of the older people from three different perspectives: physical health, mental health, and cognitive health. Through a literature survey of micro-level data, we identify measurement indicators corresponding to each aspect of older ages health. Furthermore, these three health indicators are not independent of each other; rather, they are correlated. For example, the older adults who are not healthy or experience difficulty in daily life are prone to psychological distress and even depression. Similarly, those who face difficulties in physical movement or often feel depressed are at greater risk of suffering from dementia and struggling to adapt well to daily life in society.

While reviewing the literature on the health of older-aged in China, it becomes apparent that the focus has predominantly been on physical and mental health, with insufficient attention given to cognitive health. According to the census data, China is expected to have approximately 300 million older people over the age of 60 by 2025, most of whom were born before 1965 and have experienced the Cultural Revolution (1966 – 1976) without receiving adequate education. The number of people with dementia increases with age, and China has a very big population. In the context of declining birth rates and a long-term economic recession, the care of the older ages with dementia poses a heavy burden on government finances and family expenditures. Therefore, in discussing the health of old-age, we believe that adding cognitive health to physical and mental health is necessary. In view of this point, the current study aims to fill this gap and provide reference points for policymakers.

As individuals age, not only does the absolute trend in the health of the older adults change but also the health indicators vary among individuals within the same age groups due to differing socioeconomic statuses. Black *et al.* (1980) mentioned the presence of health disparities and stratification among groups of different socioeconomic status, with those of higher socioeconomic status typically exhibiting better health status. Subsequent abundant empirical studies have consistently demonstrated the positive impact of socioeconomic status on health (Williams, 1990; Link & Phelan, 1995; Chen & Miller, 2013). Moreover, Lynch *et al.* (1994) argue that

socioeconomic status across different life stages ultimately impacts the health status of the older people. Disparities in health among different socioeconomic statuses tend to widen with age (Lowry & Xie, 2009). The cumulative effect of poor socioeconomic status over the life span culminates in the development of certain diseases (Galobardes *et al.*, 2004; Cohen *et al.*, 2010; Van den Berg *et al.*, 2010). Certain studies have even pointed out that individuals with disadvantaged socioeconomic status during childhood face a heightened risk of mortality, as children from lower socioeconomic statuses are more likely to adopt unhealthy behaviors such as smoking and drinking (Lynch *et al.*, 1994; Van de Mheen *et al.*, 1998; Chen *et al.*, 2002; Chen & Miller, 2013). The environment experienced during childhood, along with healthy habits and physical functions in midlife, is closely related and can significantly influence the aging process and susceptibility to chronic diseases throughout the life cycle (Guralnik *et al.*, 2006). In addition, Greenfield & Moorman (2019) used Wisconsin longitudinal data to verify that socioeconomic differences during childhood may have consequences for cognitive health status in later life. Therefore, socioeconomic status not only affects current health status but also exerts a cumulative and persistent impact on the health status of the older people.

Socioeconomic status usually refers to education level, household location, and specific identity factors. Zhu & Xie (2007) used education level as an indicator of socioeconomic status and verified its positive correlation with cognitive ability in China. The older people with higher education levels also demonstrate better cognitive abilities (Livingston *et al.*, 2017). To address regional inequalities within Chinese society, household location serves as a crucial distinction, particularly regarding household registration versus individual residence. Household registration is broadly divided into urban and rural types, with changing household registration being a challenging process. Individuals with urban household registration usually possess greater access to education resources and employment opportunities, initiating socioeconomic stratification from birth in China. Hayward & Gorman (2004) argued that childhood socioeconomic status affects adulthood socioeconomic status, subsequently impacting health. Children with rural household registration growing up under poor conditions may experience health consequences in adulthood. Zeng *et al.* (2007) observed that urban older adults exhibit superior cognitive abilities compared to their rural counterparts, whereas older adults tend to score higher in activities of daily living (ADLs). Regional inequality significantly contributes to social stratification in China. Furthermore, the significant outflow of young people exacerbates the

aging population in rural areas. The aging phenomenon in rural China surpasses that of urban areas, with the old-age population in rural areas being 1.8 times larger than in cities. Due to limited labor force and medical care, most older-aged living in rural areas usually experience relatively poorer health statuses.

Finally, a particular identity can be regarded as a symbol of privilege, signaling high socioeconomic status to the public. In comparison to ordinary citizens in China, only a select few have accumulated over 15 years of service in government, state-owned enterprises, universities/colleges, hospitals, and military institutions, benefitting from the “bureaucratic” welfare system. Their pensions and medical benefits far surpass those of individuals employed in the private sector, self-employed individuals, and those working in the agricultural sector. However, it is often difficult to specifically identify whether respondents have ever been employed in these government-related places using micro-level data. As a workaround, we use membership in the Communist Party of China as a proxy to reflect socioeconomic status, as most public institutions prioritize admission for party members. In addition, similar to the pension system, party membership also exhibits a cumulative effect: the longer one remains a member of the Communist Party of China, the greater the benefits they accrue. In Section 3, we use data analysis to verify the relationship between socioeconomic status and the health of the older persons.

2. Data and methods

2.1. Overview of China Health and Retirement Longitudinal Study (CHARLS)

This study used the fourth wave of the CHARLS to explore the intricate interplay between health and the socioeconomic status of old-age individuals in China. CHARLS, meticulously executed and maintained since 2008, is overseen by the China Center for Economic Research (CCER) at Peking University and the China Social Survey Center. It stands as a monumental, nationally representative longitudinal survey aimed at gathering a comprehensive dataset comprising micro-level information pertaining to families and individuals aged 45 and above in China. The overarching objective of CHARLS is to facilitate analysis of critical issues such as population aging. Its inaugural data collection took place in 2011, employing a multifaceted approach involving multistage stratified sampling across 150 county-level units and 450 village-level units, encompassing 17,000 individuals within approximately 10,000 households. These meticulously drawn samples are tracked at biennial intervals, with the dataset for 2018 constituting the fourth wave of the

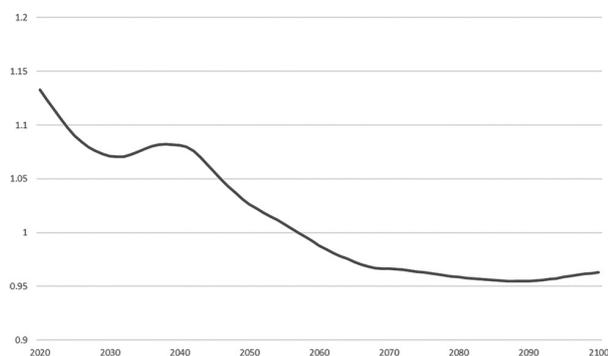


Figure 4. Public support ratio of China
Source: National Transfer Accounts using 2009 as the base year.

longitudinal survey.

CHARLS, as a rich longitudinal resource, primarily focuses on middle-aged and older-aged cohorts. It aligns itself with international best practices and serves as a valuable benchmark for cross-country comparisons. Its global counterparts include the Health and Retirement Study in the United States; the English Longitudinal Survey of Ageing in the United Kingdom; the Survey on Health, Aging, and Retirement in Europe covering continental Europe; and the Japanese Study on Aging and Retirement and the Korean Longitudinal Study of Aging in Asia. The extensive CHARLS questionnaire covers a gamut of domains, including personal demographics, familial structure and financial support, health status, employment, retirement and pension details, income and consumption patterns, as well as assets and savings. Notably, within the domain of health status assessment, CHARLS delves into fundamental health and disease records, disability assessments, cognitive function and mental health evaluations, as well as self-reported health assessments. For more detail insights into CHARLS's design and sample methodology, please refer to Zhao *et al.* (2014).

2.2. Variables and health assessment

In this study, we employed a range of variables to comprehensively assess the health of the old-age participants. We began by employing ADLs and instrumental ADLs (IADLs) as indicators of physical health. ADLs encompass fundamental daily activities such as eating, getting in and out of bed or a chair, dressing, toileting, bathing, and mobility within the home. On the other hand, IADLs assess the executive functioning involved in more complex daily tasks, including independent travel, shopping for daily necessities, managing personal finances, making telephone calls, performing heavy household chores, and engaging in general housework. In this study, both ADLs and IADLs were treated as binary variables, with individuals assigned

a value of 0 if they faced difficulty in any of these activities and a value of 1 if they could perform all these actions without impediment. This classification aligns with prior research (Gu & Dupre, 2008).

For the assessment of mental health, we rely on the Center for Epidemiological Studies Depression Scale (CESD). CESD comprises various dimensions, including assessments of depressed mood, feelings of guilt and worthlessness, hopelessness, psychomotor retardation, changes in appetite, and sleep disturbances. A higher total CESD score is indicative of more severe depressive symptoms, with a CESD total score of 16 or above signifying depression. A few surveys use the short version of CESD, called CESD-10, due to the regular version being too lengthy for certain respondents. CHARLS uses the short version CESD-10, with a total score of 10 or above signifying depression (Fu *et al.*, 2022). We acknowledge that CESD scores may vary among individuals, influenced by factors such as age, gender, and education level. Typically, studies have found a positive association between CESD scores and age, with old-age individuals reporting higher scores. Moreover, old-age women often exhibit higher CESD scores than their male counterparts. Educational attainment also plays a role, as higher education levels are often associated with lower CESD scores (Wallace & Ohara, 1992; Kimberlin & Pendergast, 1998; Everson-Rose *et al.*, 2005). To facilitate interpretation and reporting, we reversed the original CESD scores, such that higher scores indicate lower levels of depression and better mental health among the older people. Furthermore, Schuch *et al.* (2018) argue that poorer physical health in older adults tends to be associated with higher CESD scores. To explore the impact of physical health on the mental health of the older-aged, we incorporated IADLs as an explanatory variable in an alternative model (Model 4).

Finally, we employed the Mini-Mental State Examination (MMSE) score to assess cognitive ability and represent cognitive health in our regression model. Developed in 1975, the MMSE offers a comprehensive assessment of cognitive function, with a total score of 30 points. A score of 23 or lower is indicative of dementia. The prevalence of dementia is on the rise among the older adults due to increasing life expectancy. Nevertheless, Western countries such as the United States, the United Kingdom, and France have observed lower dementia incidence among more recent generations, attributed to advancements in education, socioeconomic factors, health care, and lifestyle changes (Livingston *et al.*, 2020). Conversely, East Asian countries or regions, including Japan, South Korea, Hong Kong, and Taiwan, have witnessed apparent increases in age-specific

dementia prevalence. One key driver behind these variations is differences in educational attainment. Well-educated older generations in high-income countries tend to exhibit better cognitive functioning. Furthermore, most empirical studies indicate that MMSE scores tend to decline with age; women typically score lower than men, and individuals with compromised physical or mental health are more susceptible to dementia (Van Gelder *et al.*, 2004; Marin *et al.*, 2011; Brown *et al.*, 2012; Groot *et al.*, 2016). Therefore, we introduced IADLs and CESD scores as explanatory variables in an alternative model (Model 6) to investigate the influence of physical and mental health on cognitive health among the older adults.

In summary, given the abstract nature of health, our study employed a comprehensive and objective assessment. To accommodate different dependent variable types (binary, discrete), we integrated ADLs, IADLs, CESD scores, and MMSE scores to holistically reflect the health status of older adults participants. The distribution of these indexes is presented in Figure 5-8.

2.3. Methodology and study strategy

There are many evaluation criteria for health of older people, and some studies use the older people’s self-rated health (SRH) as a variable of physical health. However, we believe that SRH of the older people is a subjective perception and instead use ADLs and IADLs as variables of physical health. In models 1 and 2, we used the results of ADLs and IADLs as the dependent variables and applied logit regression analysis, controlling for personal characteristics. For mental health analysis, we used the CESD score as the dependent variable in both models 3 and 4. Although model 3 does not consider the impact of physical health on mental health, we included IADLs as an explanatory variable in model 4 to address this shortcoming. In models 3 and 4, we used multiple regression to analyze the effect

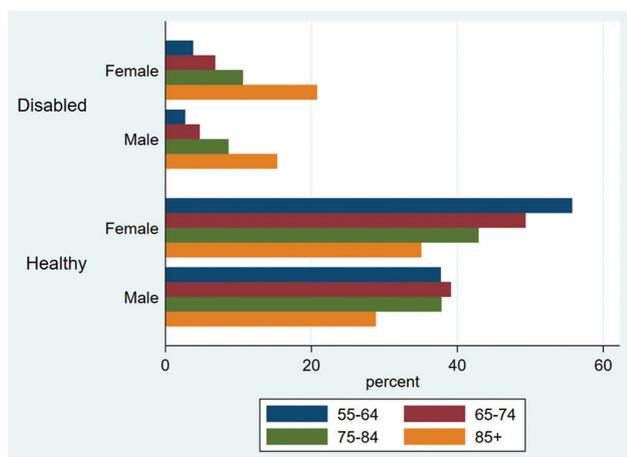


Figure 5. Age gradient of the activities of daily living index by sex

of socioeconomic variables on the mental health of older adults.

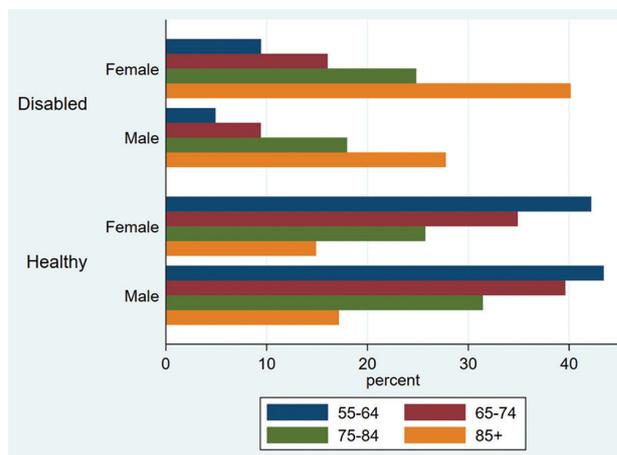


Figure 6. Age gradient of the instrumental activities of daily living index by sex

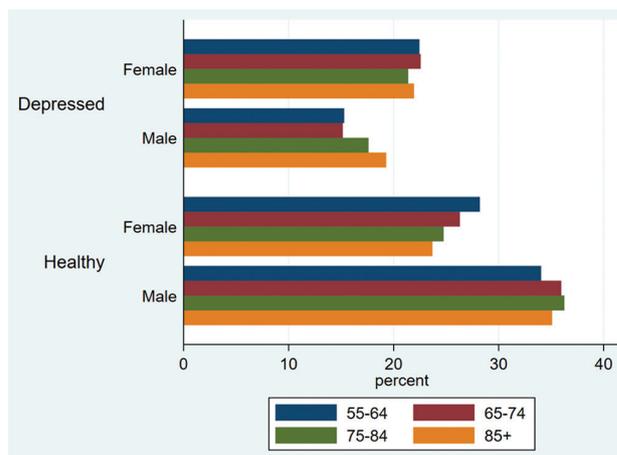


Figure 7. Age gradient of those suffering from depression (Center for Epidemiological Studies Depression Scale-10 score ≥10) by sex

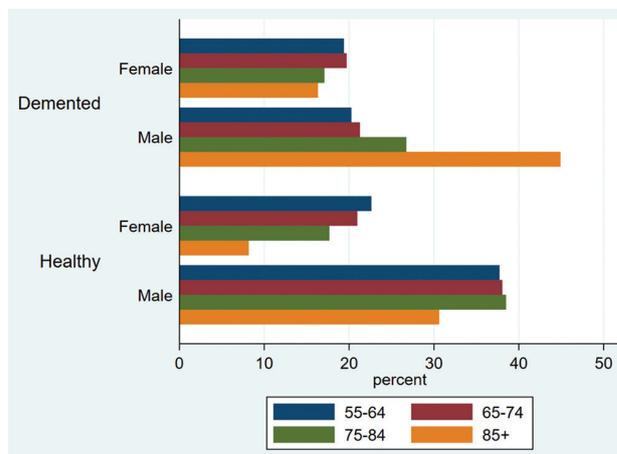


Figure 8. Age gradient of those suffering from dementia (Mini-Mental State Examination score ≤23) by sex

For cognitive health, we used the MMSE score as the dependent variable in both models 5 and 6. Since model 5 does not consider the impact of physical and mental health on cognitive health, we incorporated IADLs and CESD scores as explanatory variables in model 6. The difference between models 5 and 6 is the inclusion of these two variables to represent the physical and mental health of the older ages in model 6. Finally, in model 7, we constructed a dummy variable for the older ages who are physically, mentally, and cognitively healthy. Using logit regression, we verify if the socioeconomic variables have statistically significant positive effects on the older people's physical, mental, and cognitive health.

In addition, Table 1 presents variables that serve as proxies for socioeconomic status among the older adults, including education level, residential location, household registration type, and Communist Party of China membership. We created five dummy variables to represent various education levels. For residential location, we constructed an interaction of two dummy variables: one indicating urban residence (assigned a value of 1) and the other representing a rural household registration (assigned a value of 1). This creation of dummies resulted in four combinations reflecting different household locations: urban residence with an urban household registration (1,0), urban residence with a rural household registration (1,1), rural residence with an urban household registration (0,0), and rural residence with a rural household registration (0,1). In addition, we employed Communist Party of China membership as a proxy for the socioeconomic status of individuals who were employed in government-related institutions before retirement.

To control for potential confounding variables, we introduced control variables such as age, gender, marital status, and household status into our models to mitigate estimation bias. Furthermore, we incorporated two dummy variables into our models to account for the impact of location on interviewed households (those in well-developed eastern districts) and whether the households have savings. Both of these factors are known to influence the health of the older adults. Given China's vast territory, uneven economic development, and diverse population structures, we introduced dummy variables for specific regions, including Shanghai City, Jiangsu Province, Zhejiang Province, and Guangdong Province, primarily concentrated in the Yangtze River Delta and the Pearl River Delta. These regions exhibit higher economic output and greater demographic potential compared to others. Furthermore, in the context of China's imperfect social insurance system, we posit that the presence or absence of household savings can exert a positive influence on the health of the older adults.

Table 1. Summary statistics

Variables	Mean	SD
ADLs \geq 1	0.883	0.321
IADLs \geq 1	0.759	0.428
CESD \geq 10	0.367	0.482
MMSE \leq 23	0.411	0.492
Age	67.863	8.104
Male	0.487	0.499
Education		
Did not finish elementary school	0.216	0.412
Elementary school graduates	0.204	0.403
Junior high school graduates	0.188	0.391
Senior high school graduates	0.107	0.309
University graduates and above	0.015	0.123
Currently married	0.816	0.388
One-person household	0.201	0.401
Household location		
Urban residence with rural household registration	0.099	0.299
Urban residence with urban household registration	0.172	0.378
Rural residence with rural household registration	0.676	0.468
Communist Party of China member	0.108	0.310
Having savings	0.332	0.471
Living in the Yangtze River Delta/Pearl River Delta districts	0.095	0.293

Abbreviations: ADLs: Activities of daily living; CESD: Center for Epidemiological Studies Depression Scale; IADLs: Instrumental activities of daily living; MMSE: Mini-mental state examination; SD: Standard deviation.

In summary, our study employs a robust array of variables to comprehensively explore the multifaceted relationship between health and socioeconomic status among the older adults in China. This approach enables us to gain valuable insights into the intricate dynamics at play in this critical demographic segment.

3. Key findings

We employed the fourth wave of CHARLS data to conduct a regression analysis of the health of the older adults from three different perspectives: physical health (Models 1 and 2), mental health (models 3 and 4), and cognitive health (models 5 and 6). After analyzing these three different health perspectives of the older-aged, we attempted to combine the older people who are physically, mentally, and cognitively healthy into one index as an explanatory variable in model 7. The main results are summarized as follows:

First, in the evaluation of physical health (Table 2), we used ADLs and IADLs as explanatory variables in

models 1 and 2. In both models, we controlled for personal variables such as age, gender, marital status, and household type while examining if socioeconomic status affects the physical health of the older ages. The empirical results demonstrate that the one-person household variable has a statistically significant positive effect on the physical health of the older adults. In addition, the coefficients for “gender” and “married” are both positive in models 1 and 2. Model 1 indicates that the probability of physical health in the married group is higher than that in the unmarried group, with the difference being significant at the 5% level. Model 2 demonstrates that the probability of physical health for males is higher than for females, with the difference being significant at the 1% level.

However, we did not find any statistically significant relationship between socioeconomic status and the ADLs indicator in model 1, even though socioeconomic status variables such as education level and household location have statistically significant positive effects on IADLs in

model 2. While ADLs and IADLs are both indicators of physical health, ADLs encompass only fundamental daily activities, whereas IADLs assess the executive functioning involved in more complex daily tasks. Therefore, compared to the results of ADLs in model 1, IADLs (model 2) are more closely related to socioeconomic status. The coefficients for all education level categories are positive and have statistically significant effects on the physical health of the older people compared to those who are illiterate. In addition, the interaction variable of household location demonstrates that the older people who have urban household registration and reside in cities have a higher probability of physical health than the reference group, who have urban household registration but reside in rural areas.

Second, when analyzing mental health (Table 3), unlike previous studies, we found that there is no statistically significant correlation between the CESD score and age. This observation suggests that age may not be an important

Table 2. Estimated results concerning physical health (activities of daily living [ADLs] and instrumental activities of daily living [IADLs])

Variables	Model 1		Model 2	
	Coefficient	SE	Coefficient	SE
Age	0.018	0.048	0.048	0.038
Age square	-0.000	0.000*	-0.001	0.000***
Gender	0.002	0.072	0.259	0.050***
Married	0.681	0.324**	0.301	0.194
One-person household	0.659	0.320**	0.345	0.190*
Education level				
Illiterate (reference)				
Did not finish primary school	-0.079	0.087	0.493	0.059***
Elementary school	0.089	0.097	0.801	0.066***
Middle school	0.102	0.118	1.035	0.080***
High school	0.162	0.163	1.128	0.111***
College degree and above	0.417	0.355	1.547	0.288***
Household location				
Rural residence with urban household registration (reference)				
Urban residence with rural household registration (1,1)	-0.028	0.185	0.178	0.128
Urban residence with urban household registration (1,0)	0.093	0.172	0.281	0.121**
Rural residence with rural household registration (0,1)	0.005	0.155	-0.062	0.106
Communist Party of China member	-0.185	0.113	0.119	0.087
Having savings	0.667	0.085***	0.719	0.055***
Living in the Yangtze River Delta or Pearl River Delta districts	0.552	0.140***	0.655	0.089***
Constant	2.748	1.781	0.708	1.366
Number of observations	10,050		13,295	
Pseudo R squared	0.071		0.147	

Notes: ***Statistical significance at the 1% level. **Statistical significance at the 5% level. *Statistical significance at the 10% level.

factor in depression within Chinese society, despite some literature indicating otherwise. Given the significant disparity between urban and rural areas in China (Jiang *et al.*, 2021), our empirical results indicate that compared to the older people living in cities, those living in rural areas are more prone to depression. Both the explanatory variables “gender” and “married” have a statistically significant positive effect on CESD, implying that males tend to have better mental health than females, and that married older adults enjoy better mental health than unmarried ones. Except for the older adults who did not complete primary education, higher educational levels are associated with lower CESD scores and lower levels of depression. In terms of household location, our empirical results indicate two distinct trends among older-aged groups. One trend is that having a rural household registration and currently living in a rural area has a statistically significant negative effect on the mental health of the older people. Conversely, having an urban household registration and living in a city

has a statistically significant positive effect on the mental health of the older persons.

In addition, we observed that compared to the reference group (“rural residence with urban household registration”), the coefficient for the mental health of the older ages who fall in the category “rural household registration but live in urban area” indicates that their mental health condition is better, although there is no statistically significant evidence for this observation. This group, consisting of older people temporarily living in cities, benefits from superior services such as convenient infrastructure and high-quality medical resources. However, despite facing fewer obstacles in accessing medical care, they still harbor concerns about the cost of medical care since they are not covered by the urban medical insurance system. This discrepancy could explain why the coefficient of the variable for them is positive but lacks statistical significance. Furthermore, we identified a statistically significant positive effect on mental health

Table 3. Estimated results concerning mental health (Center for Epidemiological Studies Depression Scale-10)

Variables	Model 3		Model 4	
	Coefficient	SE	Coefficient	SE
Age	0.059	0.124	0.014	0.120
Age square	-0.000	0.001	0.000	0.001
Gender	1.527	0.136***	1.369	0.132***
Married	0.969	0.480**	0.770	0.468*
One-person household	-0.361	0.457	-0.557	0.446
Education level				
Illiterate (reference)				
Did not finish primary school	0.110	0.191	-0.298	0.187
Elementary school	0.894	0.195***	0.355	0.192*
Middle school	1.592	0.210***	0.973	0.206***
High school	2.262	0.256***	1.636	0.251***
College degree and above	2.948	0.541***	2.192	0.528***
Household location				
Rural residence with urban household registration (reference)				
Urban residence with rural household registration (1,1)	0.465	0.338	0.422	0.329
Urban residence with urban household registration (1,0)	0.871	0.309***	0.791	0.301***
Rural residence with rural household registration (0,1)	-0.756	0.285***	-0.646	0.278**
Communist Party of China member	0.390	0.207*	0.343	0.202*
Having savings	1.110	0.133***	0.823	0.130***
Living in the Yangtze River Delta or Pearl River Delta districts	1.909	0.213***	1.592	0.208***
Instrumental activities of daily living			3.784	0.162***
Constant	16.423	4.214***	14.577	4.109***
Number of observations	10,504		10,502	
Adjusted R squared	0.095		0.139	

Notes: ***Statistical significance at the 1% level. **Statistical significance at the 5% level. *Statistical significance at the 10% level.

associated with membership in the Communist Party of China. Many party members receive generous pension benefits after retirement, tend to join medical insurance schemes, and have access to long-term care resources. Therefore, older-aged Communist Party of China members need not worry about their livelihoods after retirement.

To verify whether the physical health condition of older-aged affects their mental health, we incorporated an additional explanatory variable, “IADLs,” in model 4. Our results suggest that IADLs have a statistically significant positive effect on the mental health of the older adults. This finding suggests that physically healthy older adults are usually mentally healthy as well. Furthermore, upon incorporating IADLs into model 4, the adjusted *R* squared increased by 0.044 compared to model 3. This result confirms that physical health is indeed one of the important factors influencing the mental health of the older people.

Third, concerning the results of cognitive health (Table 4), we observed that the cognitive ability of older-aged tends to improve with age in the model. However, we also found that the quadratic term of age has a statistically significant negative effect on their cognitive ability. This finding suggests that after reaching a certain age, the cognitive ability of surviving older-aged declines. In addition, on average, men exhibit significantly higher cognitive ability than women. In addition, socioeconomic status-related explanatory variables demonstrate statistically significant and positive effects on the cognitive ability of the older adults.

Compared to those who are illiterate, the older adults with higher education levels demonstrate higher MMSE scores, indicating better cognitive ability. Regarding household location, irrespective of whether the older adults have urban or rural household registration, living in cities is associated with better cognitive abilities

Table 4. Estimated results concerning cognitive health (Mini-Mental State Examination)

Variables	Model 5		Model 6	
	Coefficient	SE	Coefficient	SE
Age	0.873	0.142***	0.863	0.148***
Age square	-0.006	0.001***	-0.006	0.001***
Gender	0.388	0.100***	0.226	0.103**
Married	0.589	0.374	0.575	0.380
One-person household	0.118	0.360	0.107	0.366
Education level				
Illiterate (reference)				
Did not finish primary school	2.003	0.172***	1.907	0.180***
Elementary school	3.188	0.170***	2.973	0.177***
Middle school	3.920	0.179***	3.702	0.186***
High school	4.497	0.205***	4.230	0.212***
College degree and above	4.796	0.360***	4.476	0.365***
Household location				
Rural residence with urban household registration (reference)				
Urban residence with rural household registration (1,1)	0.567	0.234**	0.543	0.239**
Urban residence with urban household registration (1,0)	1.271	0.200***	1.107	0.204***
Rural residence with rural household registration (0,1)	-0.220	0.188	-0.256	0.193
Communist Party of China member	0.539	0.132***	0.451	0.133***
Having savings	0.579	0.094***	0.494	0.096***
Living in the Yangtze River Delta or Pearl River Delta districts	0.133	0.146	0.035	0.150
Instrumental activities of daily living			0.703	0.139***
Center for Epidemiological Studies Depression Scale			0.056	0.008***
Constant	-9.610	5.004*	-10.919	5.197**
Number of observations	5,037		4,669	
Adjusted <i>R</i> squared	0.252		0.261	

Notes: ***Statistical significance at the 1% level. **Statistical significance at the 5% level. *Statistical significance at the 10% level.

compared to living in rural areas. Moreover, the estimated coefficients of explanatory variables reveal differences in cognitive abilities even among the older adults residing in cities, depending on their household registration status. In essence, household registration reflects the cumulative effects of socioeconomic status throughout the life cycle, contributing to health disparities.

Regarding Communist Party of China membership, older-aged party members demonstrate superior cognitive abilities compared to non-party members. In China, both the health-care system and social welfare system prioritize the members of the Communist Party of China, signifying an aristocratic status among party members in Chinese society, particularly the old-age. In addition, most of those who manage to become party members originate from the elite class in society. To investigate the impact of physical and mental health on cognitive health, we extended model 5 by incorporating two new explanatory variables to form model 6: IADLs and CESD. These variables represent physical health and mental health, respectively. The results obtained from model 6 indicate that both health variables have statistically significant and positive effects on the cognitive ability of the older adults. Notably, physical health has a particularly significant effect on cognitive ability.

Finally, our analysis of physical, mental, and cognitive health (Table 5) revealed that the explanatory variable “age” and its quadratic term both have statistically significant effects. In addition, most of the socioeconomic variables, including education level, household location, and Communist Party of China membership, also exert a statistically significant effect on physical, mental, and cognitive health. Next, we made a prediction of the dependent variable while keeping other conditions constant in Model 7. As people age, the predicted health ratio initially increases (predicted dependent variable). However, this trend reverses around 72 years old. Figure 9 visually illustrates this trend, showing a sharp drop in the health ratio, especially after the age of 85, when the older adults enter the “oldest old” age category.

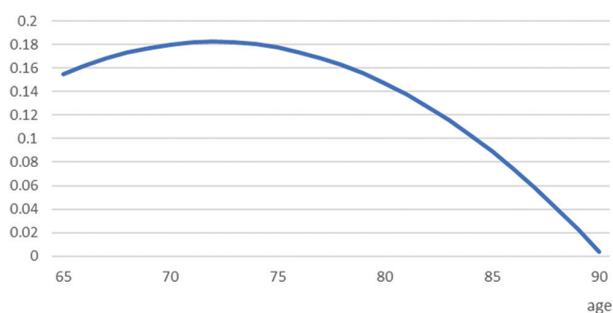


Figure 9. Predicted healthy ratio of older adults in China

In this study, we aimed to analyze the health status of older adults from three different perspectives. Irrespective of the specific health status being evaluated, we incorporated two dummy variables into each regression model: (i) whether the household has savings and (ii) whether the household is located in the Yangtze River Delta or the Pearl River Delta region. Our empirical results indicate that having savings has a statistically significant positive effect on the health condition of the Chinese older adults, regardless of their health status. In addition, the dummy variable for developed regions demonstrates

Table 5. Estimated results concerning physical, mental, and cognitive health (ADLs≥1, IADLs≥1, CESD≥10, MMSE≤23)

Variables	Model 7	
	Coefficient	SE
Age	0.080	0.006***
Age square	-0.001	0.000***
Gender	0.011	0.008
Married	0.033	0.028
One-person household	-0.003	0.028
Education level		
Illiterate (reference)		
Did not finish primary school	0.038	0.010***
Elementary school	0.109	0.011***
Middle school	0.161	0.012***
High school	0.214	0.015***
College degree and above	0.299	0.035***
Household location		
Rural residence with urban household registration (reference)		
Urban residence with rural household registration (1,1)	0.019	0.019
Urban residence with urban household registration (1,0)	0.112	0.018***
Rural residence with rural household registration (0,1)	-0.027	0.016*
Communist Party of China member	0.056	0.012***
Having savings	0.078	0.008***
Living in the Yangtze River Delta or Pearl River Delta districts	0.040	0.013***
Constant	-2.839	0.200***
Number of observations	8,396	
Adjusted R squared	0.161	

Note: ***Statistical significance at the 1% level. **Statistical significance at the 5% level. *Statistical significance at the 10% level. Abbreviations: ADLs: Activities of daily living; CESD: Center for Epidemiological Studies Depression Scale; IADLs: Instrumental activities of daily living; MMSE: Mini-mental state examination; SE: Standard error.

statistically significant positive effects on physical health and mental health, but not on cognitive health. Based on these empirical results, we can argue that there are no apparent regional differences in dementia prevalence among the older ages in China.

4. Concluding remarks

In this study, we used the micro-level data obtained from the fourth wave of the CHARLS to investigate the impact of socioeconomic status on the health of older adults in China. Our results reveal that several variables representing socioeconomic status, such as education level, place of residence, household registration type, and party membership, have statistically significant positive effects on their health status, especially mental and cognitive health. However, when it comes to physical health, we did not find a statistically significant effect of socioeconomic status on the older people's ADLs indicator. Considering that different age groups have different experiences leading to their present socioeconomic status, and socioeconomic status has cumulative and continuous effects throughout their life cycle, it is reasonable to assume that older-aged health is influenced by socioeconomic status. While the resource advantages associated with higher socioeconomic status can accumulate, we also observed that the disadvantages faced by those with low socioeconomic status accumulate over time. Health inequalities among the older adults are not solely related to current social stratification; early-life experiences also play a crucial role. This article explores the cumulative effects of early-life socioeconomic states and verifies their existence in Chinese society. Over time, socioeconomic status inequalities among the older adults exacerbate health status inequalities.

After 3 years of the pandemic in China, the post-COVID economy is in recession, the population is aging, and the population is starting to decline. Within the constraints of limited resources, the challenge lies in fairly distributing output and improving the welfare of the majority. Drawing from our empirical results on health inequality among the Chinese older people, we offer a few thoughts and suggestions.

First, in terms of education level, the middle-aged and older-aged population (over 55 years old) in this study were all born before 1963 and lived through the Cultural Revolution in China. During that tumultuous period, most young people missed out on educational opportunities or were unable to pursue higher education due to the 10-year upheaval of the Cultural Revolution. Therefore, the prevalence of dementia in old age is relatively high within this generation. However, given the popularity of education in China today and the increased rate of admission to

higher education, the chances of receiving education have greatly improved compared to 50 years ago. As a result, we anticipate a reduction in the number of older-aged people with dementia due to low education levels in the future.

Second, when considering household location, the urban-rural divide remains one of the most significant challenges in Chinese society. Even within the same provinces, substantial disparities persist between urban and rural areas across various dimensions, including education, income, medical care, and old-age care. Urban residents with urban household registrations tend to benefit from better education since childhood, increased job opportunities, higher income, and access to abundant, high-quality medical and nursing care. Therefore, the health status of Chinese living in cities tends to be better than that of their rural counterparts. Given the ongoing population aging and labor shortage, rural economic development has become increasingly important. Prioritizing local infrastructure construction and easing household registration restrictions to facilitate residents' motility are essential steps for the Chinese government. Narrowing the gap between urban and rural areas not only improves the health of rural residents but also improves the health status of the older adults.

Third, considering the distinctive identity associated with Chinese society, our empirical results suggest that middle-aged and older-aged people who are members of the Communist Party of China usually exhibit excellent mental and cognitive health, along with positive IADLs indicators. Compared to the general population, party members enjoy a higher socioeconomic status and tend to benefit from quality social welfare even after retirement. Therefore, we recommend that the Chinese government expand the scope of services within the social welfare system to include disabled individuals and those living in poverty. In addition, strengthening government transfers and wealth distribution mechanisms will contribute to overall improvements in the social welfare system.

Finally, China has recently entered the phase of an aged society last year, with the average age in the data, we used being 67.9 years old. Population aging is not yet severe, and the health condition of the older adults is relatively good, as indicated by the healthy ratio of 0.174 (Figure 9). Policymakers should proactively establish several institutions to provide long-term care services for the older persons living in rural areas, where medical resources are insufficient. We emphasize that the Chinese government needs to accelerate efforts to narrow the gap between urban and rural areas, increase the transfer of social resources, and drastically reform the social security system. By focusing on a long-term, sustainable, yet

often invisible social welfare system and social transfer, China will be better prepared to face the challenges of a society burdened with population aging and a declining population in the future.

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Consent for publication

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Availability of data

Data used in this work are available from the fourth wave of the CHARLS (<https://charls.pku.edu.cn/en/>).

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