Research on the impact of China 's aging trend on health inequality

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Abstract. This paper studies the impact of China's aging trend on health inequality. The study found that: the individual's economic status and demographic 5characteristics such as gender and marriage can cause systemic differences in the health status of different social groups. And with the deepening of aging, its health inequality will be more significant. However, in 2020, the Chinese government's comprehensive poverty alleviation measures and the popularization of comprehensive medical care are also effectively alleviating the health inequality of groups.

Keywords: aging, health inequality, economic conditions, demographic characteristics.

1. Introduction

Xi Jinping（party and state leaders）The Nineteenth National Congress highlighted the significance of individuals' well-being as a key indicator of national affluence and overall success. Health stands as an imperative prerequisite for advancing comprehensive human development, a foundational element for both economic and societal progress, a pivotal emblem of national prosperity, and a shared aspiration among the wider populace. Commencing from the outset of the 21st century, there has been a substantial advancement in the collective health status of Chinese citizens, with metrics reflecting health standards ranking favorably among developing nations. However, the health differences between different individuals are objective. The improvement of average residents ' health level can not cover up the fact that health inequality exists. Studies have shown that health inequality is expanding, and excessive health inequality will gradually evolve into a stumbling block to sustainable economic development. At the same time, China 's aging problem is becoming more and more serious, especially in recent years, the degree of aging continues to deepen, and the number of elderly people has increased dramatically. Referring to data from the National Bureau of Statistics, it can be observed that in the year 2022, the demographic group within the age range of 16 to 59, which constitutes the working-age population, numbered at 875.56 million individuals, representing a substantial 62.0% of the total. The demographic segment comprising individuals aged 60 and above is reported at 280.04 million, constituting 19.8% of the total population. Among them, the subgroup aged 65 and older accounts for 209.78 million, representing 14.9%. A comparative analysis with the figures from 2021 reveals a decline of 6.66 million in the working-age population (16-59 years old), marking a reduction of 0.4 percentage points. Concurrently, the populace aged 60 and over has witnessed an upsurge of 12.68 million, equating to an increase of 0.9 percentage points. Furthermore, the cohort aged 65 and beyond has grown by 9.22 million, signifying a rise of 0.7 percentage points.This underscores a pronounced surplus in the percentage of elderly individuals within the societal framework. Whether assessed by traditional or contemporary United Nations criteria, China has transitioned into an aging society. Given the interplay of China's maturing population and swift economic growth, the health concerns confronting the elderly have gained heightened prominence.Although China now has a universal coverage of the medical insurance system, health inequalities still exist. This article speculates that it is deeply related to the current aging trend in China year by year. Based on the background of aging in China, this paper makes a theoretical analysis of the impact of health inequality at this stage, in order to provide theoretical support for the elderly to improve health welfare and relevant departments to formulate policies.

The subsequent sections of this paper are structured as follows: Part two presents the literature review, Part three entails the research analysis, and Part four presents the concluding remarks.

2. Literature review

Health inequality in social science research is generally defined as the systematic differences in the health status of different social groups.Based on the existing research, there are two ways to measure health inequality : one is to verify the impact of SES represented by income, education and occupation on health through regression analysis. Relevant research mainly focuses on two aspects : one is the individual 's own level, such as social and economic status factors including occupation, income, education and other characteristics (such as Winkleby et al, 1992 ; smith et al, 1996 ; blakely et al, 2000 ; lowry and Xie, 2009), the second is the family, social resources and environment, social policy and system outside the individual (Coneus and Spiess, 2012 ; shi Zhilei and Wu Zhiming, 2018 ; guo Aimei and Gu Danan, 2020, etc.). Among them, among the factors at the socio-economic status level, The investigation revealed a strong correlation between health inequality and income inequality.(Wagstaff, 2000 ; van Doorslaer, 2004 ; macintyre, 2005 ; van Ourti, 2009 ; maheswaran, 2009). In their empirical study, Wagstaff et al. (2000) employed data from nine industrialized nations and discovered that the contribution of income-related factors to health inequality among Canadian adults is approximately 0.25.By studying the relevant data of 13 European countries, Van Doorslaer (2004) and others once again found that the main reason for the poor 's health disadvantage is the widening income gap.In addition, using cross-country international comparative studies, Van Ourti (2009) et albelieved that health income elasticity and income distribution play a major role in the country-specific differences in health inequality. Macintyre (2004) and other studies have found that with the widening income gap, the health advantages of the rich are gradually increasing compared with the poor.Maheswaran (2009) et albelieved that one of the most favorable explanations for health inequality is income inequality, and the promotion effect of income increase on health level is lower than the inhibition effect of simultaneous income gap widening on health level, so the overall performance is the regression of health level. From the perspective of factors outside the individual, most of them measure the degree of health inequality in various countries or regions from the family background factors in childhood (such as parents ' occupation, education, economic status, etc.) that affect health (Rosa Dias, 2009 ; li Donni et al, 2014 ; trannoy et al, 2010)In Colombia, a study was conducted to assess how the early living environment (including factors like parental background, birth area, and race) contributes to health disparities.The results show that differences in family socioeconomic status and parental education during childhood may be the most prominent factors of health inequality. In addition, Jusot et al (2010) conducted a comparative study of health inequalities in ten European countries based on data from the European Healthy Ageing and Retirement Survey, and found that inequalities in the Mediterranean and Germanic countries were more pronounced than in the Nordic and Benelux countries. Although there are not many studies on inequality of health opportunities in China, similar to the study of inequality of income and education.The results show that differences in family socioeconomic status and parental education during childhood may be the most prominent factors of health inequality. In addition, Jusot et al (2010) conducted a comparative study of health inequalities in ten European countries based on data from the European Healthy Ageing and Retirement Survey, and found that inequalities in the Mediterranean and Germanic countries were more pronounced than in the Nordic and Benelux countries. Although there are not many studies on inequality of health opportunities in China, similar to the study of inequality of income and educationopportunities, the environmental factor of urban and rural household registration still attracts the attention of scholars. For example, Lu Wanbo et al (2018) found that there are obvious differences between urban and rural areas, coastal and inland differences in the overall health level of middle-aged and elderly people in China. Fitness venues, service organizations, industrial pollution sources and toilets can flush water are important environmental factors that cause health inequalities, and then further compare the urban-rural differences in health inequalities among the elderly through the MM decomposition model ; ma et al (2017a) used the micro-survey data of three representative regions in Jiangsu Province to find that the implementation of urban and rural medical insurance co-ordination has significantly alleviated residents ' medical service utilization and health inequality.

Another approach involves assessing health inequality within specific regions or groups by constructing relevant measurement indices. Six primary indicators are commonly used for measuring inequality: The methods employed include the range method, Lorentz curve, Gini coefficient, difference index, inequality slope index, concentration index, and Erreyger index.Among these, Le Grand (1989) introduced the Lorenz curve and Gini coefficient to measure pure health inequality, while the focus of public and academic attention often extends to health inequality in relation to socioeconomic factors. Building upon this foundation,Wagstaff (1989) introduced the concentration index as a means to quantify health inequality related to income, thereby permitting decomposition to assess the diverse impacts on health inequality. Subsequently, the Erreyger index further enhances the conventional concentration index, facilitating a more comprehensive breakdown of income-associated health disparities (Erreyger, 2009).In recent years, a growing number of scholars in China have directed their attention toward health inequality concerns. Zhao Zhong et al. employed median and first-order stochastic dominance methods to estimate health levels and inequality across the entire population. The outcomes reveal substantial disparities in health inequality between urban and rural areas, with rural residents experiencing significantly greater inequality than their urban counterparts. Hu Linlin utilized self-rated health data to calculate residents' health concentration index, demonstrating persistent high levels of health inequality.Deng Quheng (2010) employed data from the Chinese Academy of Social Sciences Institute of Economics to gauge and dissect health inequality among urban residents based on income levels. His findings suggested that variables such as residing in larger cities can mitigate income-based health inequality. Xie (2010) conducted an extensive analysis of the influence of income levels on health inequality and disparities in medical service utilization, utilizing data sourced from the China Health and Nutrition Survey (CHNS).The findings underscored the existence of health inequality and disparities in medical service usage among the affluent, revealing an expanding trend. The contribution of income to health inequality and medical service utilization disparity ranged between 0.13 and 0.20.Further studies, such as Huang Xiao's (2012), also confirm deepening health inequality among the affluent in China.

In summary, the existing literature has fully studied the relationship between individual factors such as occupation, income, education, and non-individual factors such as family and country and health inequality, but now the research ignores the impact of population aging. Therefore, this paper aims to incorporate the factors of population aging into the analysis, make up for the shortcomings of existing articles, and provide a theoretical basis for the impact of population aging on health inequality.

3. Research and analysis

The data utilized in this study were derived from the China Health and Retirement Longitudinal Study (CHARLS). Managed by the National Development Research Institute of Peking University and carried out by the Chinese Social Science Survey Center of the same institution, this extensive longitudinal survey initiative focuses on tracking changes over time. It entailed surveying individuals aged 45 and above, encompassing middle-aged and elderly residents from across China. Encompassing a comprehensive sample of 450 villages and communities spanning 150 counties across 28 provinces in mainland China (excluding Tibet), the survey achieved an impressive response rate exceeding 80%. The primary focus of this paper is to compute concentration indices spanning the years 2011 to 2018 and subsequently evaluate variations in the concentration index based on cross-sectional data across different time periods.

（1）Aging and economic and social status

The concentration index in Table 1 shows the status and trends of health inequality. It can be seen that the inequality of more objective health measurement indicators is greater, while the inequality of more subjective health measurement indicators is smaller, and the inequality of depression is the smallest.The findings of this study reveal that between 2011 and 2018, although there has been a slight escalation in the socioeconomic status inequality related to the self-rated health of middle-aged and elderly individuals in China, there is no substantial variance in self-rated health inequality

observed across the years (with a corresponding P-value of 0.726).The discrepancy in Activity of Daily Living (ADL) and Instrumental Activity of Daily Living (IADL) among middle-aged and elderly individuals showcases a pattern of increasing fluctuations, underscored by significant shifts in health inequality over the course of time. When comparing health inequality metrics for self-assessment, ADL, and IADL, it is evident that ADL inequality experiences the most rapid increase, with an average annual growth rate of 6.66%. Conversely, health self-assessment registers the slowest rate of change, with an average annual growth rate of 0.83%. Differing from the altering trends seen in other health indicators, the level of depression inequality among middle-aged and elderly individuals displays a significant downward trajectory, characterized by an average annual decline of -2.61%. This trend suggests a recent mitigation of depression inequality among China's middle-aged and elderly population.

Table 2 clearly shows the changing trend of health status of middle-aged and elderly people grouped by household fixed assets. It can be seen that from 2011 to 2018, only the proportion of poor self-rated health of the elderly in the poorest group showed an upward trend, and the proportion of ADL and IADL impairment in this group increased the fastest, much higher than that in other groups. The proportion of poor self-rated health in other groups showed a downward trend, with the slowest decline in the richest group and the fastest decline in the Q2 group. The proportion of ADL impairment in Q3, Q4 and the richest group of middle-aged and elderly people showed a downward trend, among which Q3 group decreased the fastest and Q4 group decreased the slowest. Only the proportion of IADL impairment in Q3 and the richest group showed a downward trend, among which the proportion of the richest group decreased the fastest. From the perspective of the change trend of depression in different groups, the poorest group basically maintained a stable and unchanged state, Q2 and Q3 groups showed an improvement trend, while Q4 and the richest group showed a deterioration trend, among which the richest group The rate of deterioration of depression was faster. Comparing the health trends of each group as a whole, the measurement of subjective and objective health indicators in the poorest group did not show a trend of good development, while the comprehensive indicators of health self-assessment and more objective ADL and IADL in the richest group showed a trend of good development, but depression showed a trend of deterioration.

Table 1 The status and trends of health inequality

Health index	2011	2013	2015	2018	average annual growth rate	p-value
health self-assessment	-0.174	-0.170	-0.189	-0.184	0.83	0.726
ADL	-0.219	-0.322	-0.407	-0.344	6.66	<0.001
IADL	-0.222	-0.281	-0.351	-0.290	3.92	<0.001
depression	-0.111	-0.090	-0.102	-0.093	-2.61	<0.001

Table 2 Health status of middle-aged and elderly people grouped by household fixed assets from 2011 to 2018

Health index	2011 Household Fixed Assets Quantile Group							
	Total sample	Poorest group	Q2	Q3	Q4	The richest group	Poorest/richest group	P-value
health self-assessment（%）	26.48	35.71	34.01	26.10	18.81	13.66	2.61	<0.001
ADL（%）	5.89	8.92	6.86	5.72	4.58	2.32	3.85	<0.001
IADL（%）	12.84	19.47	16.19	11.69	8.63	6.25	3.12	<0.001
Depression (mean)	8.07	10.09	9.27	7.87	6.64	5.71	1.77	<0.001
Health index	2013 Household Fixed Assets Quantile Group							

	Total sample	Poorest group	Q2	Q3	Q4	The richest group	Poorest/richest group	P-value
health self-assessment（%）	23.45	32.52	25.27	25.33	18.07	13.54	2.40	<0.001
ADL（%）	6.37	11.41	6.30	5.67	3.72	2.65	4.31	<0.001
IADL（%）	14.07	23.80	14.38	12.50	9.31	6.18	3.85	<0.001
Depression (mean)	7.54	9.03	8.25	7.75	6.90	5.66	1.59	<0.001
Health index	2015 Household Fixed Assets Quantile Group							
	Total sample	Poorest group	Q2	Q3	Q4	The richest group	Poorest/richest group	P-value
health self-assessment（%）	20.90	30.20	24.85	20.26	14.86	10.65	2.83	<0.001
ADL（%）	6.25	12.89	7.49	4.69	2.02	1.30	9.95	<0.001
IADL（%）	14.00	26.41	16.13	11.71	6.02	3.80	6.95	<0.001
Depression (mean)	7.54	9.03	8.25	7.35	6.49	5.64	1.67	<0.001
Health index	2018 Household Fixed Assets Quantile Group							
	Total sample	Poorest group	Q2	Q3	Q4	The richest group	Poorest/richest group	P-value
health self-assessment（%）	25.05	37.49	27.08	21.47	16.29	12.25	3.06	<0.001
ADL（%）	7.22	14.47	7.39	4.07	3.72	1.74	8.32	<0.001
IADL（%）	16.55	30.59	16.84	11.28	8.75	5.75	5.32	<0.001
Depression (mean)	8.10	10.13	8.69	7.34	6.90	6.00	1.69	<0.001

Aging and basic characteristics of population

Analyzing the decomposition outcomes of the concentration index for depression levels among middle-aged and elderly individuals, it becomes evident that key population characteristics exert distinct influences. Specifically, age, gender, and marital status play significant roles in shaping the extent of depression experienced by this demographic. Notably, the depression level appears to be lower among men and middle-aged and elderly individuals who are married. In broader terms, advancing age appears to have a mitigating effect on depression inequality among this group. Conversely, gender and marital status exacerbate depression inequality within the middle-aged and elderly cohort, with respective contribution rates of 2% and 6.3%.Hukou status emerges as a notable determinant in shaping the depression levels among middle-aged and elderly individuals. Remarkably, this influence significantly amplifies depression inequality within this demographic, with respective contribution rates of 3.4%, 21.4%, and 46.9%. Strikingly, middle-aged and elderly individuals possessing non-agricultural hukou exhibit comparatively lower levels of depression.

Table 3 Analysis of population basic characteristics of health inequality in old age

	Self-rated health		ADL		IADL		despondent	
	coefficient	Contribution rate (%)	coefficient	Contribution rate (%)	coefficient	Contribution rate (%)	coefficient	Contribution rate (%)
Gender (Male)	-0.035	0.8	-0.14**	0.84	-0.052	0.5	-0.148*	-50.47
Marriage (with spouse)	-0.009	1.82	0.015	-0.33	0.040	-1.28	-1.007***	6.34
Household registration (non-agricultural)	-0.078	2.74	0.032	-0.27	-0.002	0.8	-0.468*	3.37
age	0.036	53.03	-0.009	0.06	-0.040*	-32.15	0.157	41.6

Note : * * *, * *, * indicate that the coefficients are significant at the 1 %, 5 % and 10 % levels, respectively.

Analysis of the impact of aging on health inequality

The ageing trend in general will exacerbate health inequalities. Because people will have more and more diseases in their old age, but at this time, in the theory of intergenerational alternation, the elderly only have savings, so they rely heavily on the economic strength of the elderly population. As described above in "aging and economic and social status", the health conditions of middle and old people in our country become obvious with their own widening gap between rich and poor. China is a country that gets old before it gets rich. With the gradual deepening of aging, the wealth gap will become more and more obvious, and the health inequality will also increase. However, in general, China's medical security and social security system can alleviate the impact of aging on health inequality, but can not change its positive impact.

4. Conclusion

Aging can not only be regarded as a biological process, but also as a major social phenomenon influenced by broader social, political and economic factors. Modern technology has extended human life to more than 20 years since the beginning of the 20 th century. Extending lifespans offers advantages not only to the elderly and their families but also to society at large. The rise in life expectancy provides individuals with the chance to explore fresh prospects, encompassing additional education, novel careers, or interests long put aside.The elderly possess various avenues to make valuable contributions to their families and communities. Nonetheless,The scope of these possibilities and the subsequent contributions heavily rely on a pivotal factor: health.Nonetheless, economic standing, individual demographics such as gender and marital status, can engender systemic disparities in health across distinct social groups. Furthermore, as the aging process becomes more pronounced, the magnitude of health inequality will likely intensify. However, in 2020, the Chinese government 's comprehensive poverty alleviation measures and the popularization of comprehensive medical care are also effectively alleviating the health inequality of groups.

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