

Socioeconomic status trajectories and health in China

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Abstract

Background: After 40 years of reform and opening-up, China's social and economic conditions have undergone tremendous changes. For individuals who have experienced this historical period, the socioeconomic transition has brought different effects on their health status. This research examines the issue and provides evidence that government policies need to be improved. **Methods:** This study adopted data from the 2015 China Health and Retirement Longitudinal Study (CHARLS). We set the education level, occupation, and family income during old age as the socioeconomic status for the early, middle, and late stages of life. Based on specific criteria, we classified the population as disadvantaged and advantaged, considering eight changing trajectories of socioeconomic status. We used multiple regression analysis to examine how the eight trajectories affect individuals' physical and mental health. **Results:** After controlling for social demography and health behavior variables, we found that compared with those in the advantaged group long term, people who were in the disadvantaged group suffered from a significantly negative impact of their socioeconomic status on physical and mental health. The health status of those who moved upward in socioeconomic status was substantially better than those who remained in the same status. **Conclusion:** This study confirms that early disadvantaged socioeconomic status has a long-term adverse effect on health. However, the negative impact can be mitigated by improving one's occupation during middle age or family income during old age throughout China's socioeconomic transitions. Therefore, increasing upward social mobility at any stage helps eliminate health inequalities.

Background

After 40 years of reform and opening-up, China's social and economic conditions have undergone tremendous changes. In such an era, the development of the market economy and the advancement of urbanization have transformed the fragmented status of urban and rural areas. The population mobility between the two has been strengthened, which has provided endless opportunities to improve individuals' socioeconomic status. For individuals who have experienced this historical period, the socioeconomic transition has brought different effects on individuals' health status. We analyzed the individual socioeconomic factors associated with health inequalities, explored their roles of eliminating health inequalities during the transition, and provided evidence to that government policies need to be improved.

Eliminating health inequalities has become the focus of public health policy across countries in recent years ^[1]. Independent of the socioeconomic indicators used, the existing research all suggest that social inequalities exist in health ^[2]. That is, compared with those with a favorable socioeconomic status, those with a nonfavorable socioeconomic status had worse physical and mental health as well as high mortality, even among the middle-aged and elderly population ^{[3][4]}. Research that applied the life course approach to study the health effects of social factors indicated that the determinant of disease or health lied in the early stage of life ^{[5][6]}. An individual's early experience was associated with disadvantages and opportunities in one's later life. The disadvantages or opportunities influenced the individual's life

trajectory as one aged. Through different mechanisms (potential effects, path effects, and cumulative effects) in the life process, the disadvantages or opportunities influenced the individual's life outcomes [7]. Previous studies of the life course approach focused on the relationship between socioeconomic status and health status or mortality during embryonic, childhood, adolescent and adolescent periods. These studies explored the impact of changes in socioeconomic status on health and death in later years through three factors: critical period, accumulation of risk, and social mobility [8][9].

The critical period refers to the impact of harmful or protective exposure at a particular time to individuals' future health and development. David Barker, the British epidemiologist, first established the concept in his fetal origins of adult disease hypothesis. He suggested that a mother's nutrition and health status during pregnancy would affect the probability of cardiovascular disease of the next generation [10]. However, subsequent studies suggested that the critical period was not limited to the fetal period and that any stage of life may be a crucial sensitive period [11]. If one were exposed to high health risks during critical periods, there would be a direct or decisive impact on health status, known as the latent effect model [7]. Risk accumulation means that risks or protective factors accumulate with the extension of life. If individuals of low socioeconomic status are exposed to risks long-term, adding the negative impact of a disadvantaged environment in the early years, the adverse effects would increase with time. These unfavorable conditions aggravate inequalities, making health and death disparities more salient [12]. The risk factors can cluster and impose independent influence on health. The impact may also cause the early life experience to change the next opportunity in life, which in turn triggers more opportunities. Finally, the factors affect health and mortality in the form of chains of risk, i.e., the pathway effect model [7]. Studies of social mobility indicated that upward mobility led to higher socioeconomic status with different mechanisms, such as obtaining the same material living standards, education levels, healthy living conditions, and less psychological stress. Individuals who move upwards share similar health risks with those in the upper class, whereas the health of those who move downwards may be worse than that of those in the upper class [13][14].

Socioeconomic status is a multidimensional concept. The concept includes health-related factors such as environment (residence characteristics, resource acquisition, pollutants, etc.), social psychology (stress, subjective status), and behaviors (diet, smoking, sports). Therefore, socioeconomic status can be considered as a fundamental cause of health or disease [15]. Previous studies on health inequality from the life course perspective often used various socioeconomic indicators, such as parental education, occupation, family income, economic status at birth, birth weight, and extraordinary adversity as individual socioeconomic indicators at birth or in childhood [16][17]. For adults aged 25 and over, education level, income, and occupation were socioeconomic indicators of young and middle-aged individuals; for the elderly, family income, assets, and living environment were adopted as socioeconomic indicators [17][18]. Although frequently used, all indicators have advantages and disadvantages; however, one single indicator cannot comprehensively measure socioeconomic status. In studies on health inequalities, these socioeconomic indicators can reflect the health gradient through theoretical causal relationships [19].

In summary, there are insufficient studies on health effects resulting from changes in socioeconomic status at different life stages, such as the impact of changes in socioeconomic status on adults' cardiovascular mortality, physiological function, and sick leave from work^{[20][21][22]}. Only a small number of studies included elderly samples^[23]. Moreover, most of the past research has been concentrated in developed countries or regions. Therefore, relevant research needs to be extended to developing countries such as China, where the generation who experienced China's 40 years of reform and opening-up is aging. The transition from middle aged to elderly is a significant turning point in the life cycle. At this stage, individuals face many life challenges, including retirement, separation from children, widowhood, and death of their peers. These challenges increase the physical, psychological, social, and behavioral risks of health hazards. Therefore, to ensure the elderly have a good health status, the policies implemented by the Chinese government need to focus on social factors in early life, thus providing effective measures to achieve healthy aging in Chinese society. Based on the data from the 2015 China Health and Retirement Longitudinal Study (CHARLS), this study used a sample of retired elderly individuals and analyzed the health effects of the trajectories formed by the changing socioeconomic status at different life stages.

Methods

Data

This study used data from the 2015 CHARLS. The CHARLS was launched in 2011 and included 150 county-level units, 450 village-level units, and 17,000 individuals in approximately 10,000 households. The main target of the study was families that included middle-aged or elderly individuals as well as individuals aged 45 and over. According to the current retirement policy in China, the retirement age for males, female cadres, and female workers is 60, 55, and 50, respectively. In this study, women aged 55 years and older and men aged 60 years and older were selected as samples, resulting in a total sample of 2225 individuals.

Variables and measures

Health variables

The dependent variable of this study was health status, including both physical and mental health. The selection of physical health variables was based on self-rated health: What is your self-rated health? Very good, good, average, bad, or very bad? The response was assigned a value of 1-5; the larger the number was, the worse the health condition. The Center for Epidemiologic Studies Depression Scale (CES-D) was used to assess the respondents' depression. The CES-D scale is often used as a tool to measure depression. The CES-D scale for CHARLS data contained three depressive emotional items, five physical symptom items, and two positive emotional items. Each entry required the respondent to evaluate the feelings and behaviors of last week. Respondents chose among "rare or none (<1 day)", "not too much (1-2 days)", "sometimes or half of the time (3-4 days)" and "most of the time (5-7 days)". Referring to past studies, we assigned values of 1-4 to the above options for depression and physical symptom entries and

used reverse coding for positive emotion entries. We summed the total score of 10 entries to reflect the mental health status, ranging from 1 to 40 points. The higher the score was, the worse the mental health status.

Socioeconomic status variables

Based on the existing literature, this study used respondents' education level as the indicator of socioeconomic status in early years, primary occupation as the middle-aged socioeconomic indicator, and the family's annual income as the late years indicator. Three indicators reflect the trajectories of change in socioeconomic status: education, occupation, and family income. The purpose of this study was to measure whether respondents experienced a disadvantaged socioeconomic status at different stages of life. We classified the indicators as disadvantaged and advantaged.

There were 11 education level categories based on the respondents' highest education in the CHARLS. The respondents in this study were retired, and education was not popularized in their early years in China; therefore, the 'respondents' education levels were generally low. This research identified primary school education or lower as low level of education, i.e., disadvantaged socioeconomic status. Primary occupation was used to measure socioeconomic status in the middle-age period. There were three occupational identities of the working population in the Chinese social system: farmers, workers, and cadres. The division of the occupational identities was closely associated with income and benefits. Due to the restrictions of household registration, farmers had great difficulties in transforming their occupational identities to workers or cadres through paths such as receiving higher education. Therefore, using responses to "Were a cadre or a worker when you retired?" and the household registration information in the CHARLS, this study considered peasants as a disadvantaged socioeconomic group whereas workers and cadres were considered an advantaged group. The study used respondents' annual household incomes as the socioeconomic indicator in the later years. Household income (respondents and their spouses) in 2015 included pension, salary, government subsidies, spouses' income, and revenue from farming, poultry, and family business. China has a strict definition of poor households: absolute poverty (annual net income less than 627 RMB yuan per capita), relative poverty (annual net income from 628 to 865 yuan per capita), low income (annual net income from 866 to 1,205 yuan per capita), and general/high income (annual net income greater than 1,025 yuan per capita). Individuals with an annual net income less than 1,205 yuan were considered the disadvantaged group. Based on the criteria, we classified families with an annual income less than or equal to 1,205 yuan as disadvantaged and those who earned greater than 1,205 yuan as advantaged.

Other control variables

Other control variables in this study included sociodemographic characteristics and health behaviors. Sociodemographic variables included age, gender, marital status (with/without a spouse), and residency status (living alone or with others). Health behavior variables included drinking habits ("Did you drink in the past year," yes/no), smoking habits (based on responses to "Have you ever smoked" and "Are you still

smoking," we divided the respondents into smoking and nonsmoking), and exercise habits ("Do you perform intense or moderate physical activity for the purpose of exercise," yes/no).

Socioeconomic status trajectories

According to the corresponding socioeconomic indicators of the respondents' early, middle, and late stages, education level, occupation, and family income were assessed for the disadvantaged population. Those who had an elementary school and lower education, were farmers, and had an income below 1205 yuan were considered the disadvantaged population. The three indicators of socioeconomic status at different stages fell into eight trajectories based on whether the individual belonged to the disadvantaged group (Table 1).

Statistical analysis

The variables' descriptive statistics are displayed in Table 2. The average score for self-rated health was 3.516, indicating that the majority rated their health status as poor. The mean score for mental health was 18.496, suggesting that the respondents were not optimistic about their mental health. In terms of individual characteristics, the average age of the sample was 67 years old; 76.2% of the respondents were married, and approximately 21.3% lived alone. A total of 38.6% and 29.5% of the respondents were smokers and consumed alcohol, respectively, and 23.4% reported that they exercised. The results indicated that the respondents did not have a high proportion of poor health behaviors. However, the percentage of respondents with healthy exercise habits was not high either. Regarding socioeconomic status, most of the respondents were not highly educated. Farmers were the majority. The respondents' average annual household income was also modest. Table 1 provides the distribution of socioeconomic status trajectories. The seventh trajectory accounted for the highest proportion. That is, most of the sample moved upward in later life. The eighth trajectory ranked second. In addition, the ratio of downward flow was low, i.e., individuals who received a good education seldom moved downward, such as the second and the fourth trajectories.

Results

Table 3 illustrates the impact of sociodemographic and socioeconomic variables on self-rated and mental health. The results show that socioeconomic status can significantly affect self-rated health and mental health. The higher was the level of education, the better the job. The higher was the family income, the better the physical health and mental health. In terms of sociodemographic characteristics, age and health were positively correlated. The older one was, the worse the physical and mental health. Females and those who lived alone were more likely to suffer from mental health problems. In terms of health behaviors, smoking and drinking significantly affected physical and mental health, while maintaining regular exercise was more beneficial to mental health.

Table 4 shows the multiple regression results for socioeconomic trajectories and health. The results of the study showed that the impact of changes in socioeconomic status on self-rated health was a gradient

process. The more disadvantaged periods one experienced, the worse was the self-rated health. Compared with Type 8 (three periods were analyzed for disadvantaged socioeconomic status), Type 1, Type 3, Type 5, and Type 7 all had significant effects on self-rated health. Type 1 had the most significant effect, indicating that fewer disadvantaged socioeconomic periods resulted in a more positive view of one's health. Type 7 had a high coefficient that was statistically significant. The results suggested that although late-stage improvement in socioeconomic status weakens the negative effect of an early disadvantage, the negative effects of early and middle aged disadvantages on self-rated health still exist. In Type 3 and Type 5, although the respondents only experienced one disadvantaged stage, Type 3 had a more significant impact than did Type 5. The results indicate that occupational identity had a higher effect on self-rated health than did education level. The result is consistent with that in Table 3.

In addition, the results in Table 4 also show that although the effects of Type 2 and Type 4 were not significant, their coefficients were high. The possible reason is that in the era of China's planned economy, receiving a better education was an important means of entering a more advanced position to obtain a higher income. For the respondents who received a better education in their early years, the probability of moving downward was low. Therefore, the proportions of respondents experiencing two trajectories were small, accounting for only 1.03% and 1.52% respectively. However, using Type 8 as the baseline, the results were not statistically significant for Type 2 and Type 4. We also found that a good education has a long-term effect on health. Even if the individual experienced a disadvantaged socioeconomic status in later periods, schooling enabled one to be more capable of acquiring health knowledge and to have a stronger desire for disease prevention. Hence, the health effects of a good education can last through middle and old age.

Unlike the impact of disadvantaged socioeconomic status on self-rated health, the effects of trajectory type on mental health failed to indicate that the greater the number of disadvantaged periods, the worse was the mental health status. Except for Type 2, all the other trajectory types showed a significant impact on mental health. Type 1 showed the highest correlation in that when the respondents had never experienced a disadvantaged period, their mental health was the best. Type 6 and Type 5 had lower coefficients than that of Type 1. The results suggest that individuals had not experienced disadvantages in middle age and that disadvantages presented a significant impact on mental health. The coefficients for Type 5 and Type 3 were high, indicating that a lack of disadvantages in later life is beneficial for mental health. The results for Type 4 and Type 7 revealed that the lack of a disadvantaged socioeconomic status had a small effect on mental health.

Finally, based on whether one experienced a disadvantaged socioeconomic status in early or later years, all samples fell into four types of social mobility: long-term advantaged socioeconomic status (Type 1 and Type 3), upward mobility (Type 5 and Type 7), downward mobility (Type 2 and Type 4), and long-term disadvantaged socioeconomic status (Type 6 and Type 8). Table 5 shows the regression results for the relationship among the four conditions and health. The results imply that compared with those who experienced a long-term disadvantaged socioeconomic status, respondents who experienced a long-term advantaged status had better self-rated health. The influence of long-term advantaged socioeconomic

status on positive self-rated health is better than that for upward mobility, followed by downward mobility. Therefore, although downward mobility decreased self-rated health, advantaged status in early years alleviated the negative effect; therefore, their self-rated health was not as negative as that for long-term disadvantaged individuals. Correspondingly, the movement upward to a favorable socioeconomic status benefited respondents' self-rated health. However, disadvantaged status impaired their self-rated health. Similar to those for self-rated health, the results for mental health status were consistent with the socioeconomic trajectories. The rank of the degree of influence on mental health is long-term disadvantaged, upward mobility, and downward mobility. The result confirms that a disadvantaged status in later years had a more significant impact on mental health.

Discussion

This study applied the life course approach to analyze the relationship between socioeconomic status trajectories and health. We analyzed the impact of changes in socioeconomic status in terms of health inequality from the life course perspective. First, we discussed the effect of critical period or sensitive period. We found that disadvantaged socioeconomic status at any time was detrimental to health. For example, low education in early years was not conducive to health in old age, which had a constant effect that could not be offset by the improvement of socioeconomic status in middle age or later years. The finding is consistent with research results indicating that disadvantages in life increase the risk of chronic diseases for up to 20 years [24]. The results of this study illustrate a similar finding in that respondents who received a better education in the early years had no increased health risks in their later years despite downward movement in their socioeconomic status. Individuals with better education have better access to health information and more relevant resources. They are more likely to be proactive regarding disease prevention, receive health care and medical treatment, and possess more social capital and a support system. All factors interact with each other and influence the body aging rate, morbidity, and mortality [25]. Occupational identity has a significant impact on self-rated health and mental health. This result is slightly different from that of previous studies, which suggest that there is an inconclusive relationship between agricultural production and mental health [26]. However, the conclusion is different in China because a farmer is not only an occupation but also a social identity. Being a farmer implies a substantial disadvantage in socioeconomic status, which significantly affects physical and mental health. The study also found that family income during old age can substantially affect self-rated health and mental health. The higher the income was, the better the health. The result shows that the economic security of elderly individuals is critical. When the elderly retire, their income decreases, and health expenditures increase. Therefore, the financial dependence of the elderly will increase.

We then discussed the health effects of changes in socioeconomic status from the perspective of cumulative effect. We found that all three periods had a significant negative impact on self-rated health if respondents had a disadvantaged socioeconomic status, with a gradient or dose-response relationship. The conclusion is consistent with the theory of health inequality. Independent of life stage, the more frequently one falls into a low socioeconomic status, the more one will experience health risks.

Consequently, the probabilities of poor self-rated health and mental health increase during old age. The existing international research also note that long-term poverty results in high adult mortality ^[27]; insufficient economic resources cause various health problems ^[28]; long-term low income during middle age leads to higher rates of death from cardiovascular diseases; and low socioeconomic status and low level of education in early childhood contribute to poor physical function in old age ^[29] ^[30]. That is, as long as one can improve one's socioeconomic status at any time, health risks can be reduced.

Consistent with social mobility theory ^[10] ^[15], our results imply that the health risks among those whose status moved downward are higher than those who moved upward. The decline in family incomes during old age may be the result of retirement or an increase in medical expenditures resulting from declining health. Moreover, downward mobility suggests the failure of fulfilling the individual's expectation, which causes a negative psychological impact. Although the health risks experienced by those whose status increased are fewer than those status decreased, some health risks encountered in the early stages cannot be offset with the improvement in socioeconomic status. The results indicate uncertainty in whether changes in socioeconomic status can improve population health or reduce health inequalities ^[12] ^[13]. Increasing one's socioeconomic status provides opportunities for varied functional activities and enhances personal health. Moving downward, however, not only reduces one's socioeconomic status but also has a detrimental effect on one's health.

Conclusion

The study used CHARLS data from 2015 to explore the health effects of changes in socioeconomic status trajectories. We find that in the context of China's economic and social changes, individuals' efforts to enhance their socioeconomic status help eliminate health inequalities. For those who experience a disadvantaged socioeconomic status in early years, health risks can be reduced if the individual can improve his or her socioeconomic situation in any subsequent period. Therefore, upward mobility is an effective method for improving personal health. Regarding inevitable downward movement, one should maintain the effects of existing advantages.

Declarations

***Ethics approval and consent to participate**

Ethical approval for this study was not required because it was based exclusively on the publicly available data, CHARLS, and the study subjects were not directly approached.

***Consent for publication**

Not applicable.

***Availability of data and material**

***Competing interests**

The authors declare no conflict of interest.

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***Authors' contributions**

All authors were involved in planning of the study and interpretation of results. WN and HWH conducted the data analysis and wrote the first draft of the paper. ZLL critically reviewed the paper and edited the manuscript. All authors read and approved the final manuscript.

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Tables

Table 1 Eight trajectories of socioeconomic status

Type	Early life	Middle aged	Later life	Notes	Percentage (%)
1	No	No	No	No disadvantaged situation during any stage of life	9.01
2	No	No	Yes	Disadvantaged during later life only	1.03
3	No	Yes	No	Disadvantaged during middle age only	10.48
4	No	Yes	Yes	Disadvantaged during middle age and later life	1.52
5	Yes	No	No	Disadvantaged during early life only	4.7
6	Yes	No	Yes	Disadvantaged during early and later life	1.39
7	Yes	Yes	No	Disadvantaged during early and middle age life	56.45
8	Yes	Yes	Yes	Disadvantaged during all life stages	15.41

Table 2 Descriptive statistics of variables

Variables	Mean	Standard error	Minimum	Maximum
Self-rated health	3.516	1.060	1	5
Mental health	18.496	6.588	10	40
Age	67.093	7.629	55	105
Gender	1.573	0.495	1	2
Residency	0.213	0.409	0	1
Marital status	0.762	0.426	0	1
Smoking status	0.386	0.487	0	1
Alcohol use	0.295	0.456	0	1
Physical exercise	0.234	0.424	0	1
Education level	2.884	1.896	1	10
Occupation	0.200	0.498	0	2
Annual family income	19598.560	66672.860	0	3007500

Table 3 Relationship between socioeconomic status and health

	Self-rated health		Mental health	
	Coefficient	Standard error	Coefficient	Standard error
Age	0.001	0.003	0.003	0.021
Gender	0.017	0.065	2.130 ^{***}	0.412
Residency	0.059	0.070	1.053 ^{**}	0.456
Marital status	-0.022	0.059	-0.562	0.380
Smoking status	0.097 [*]	0.060	0.987 ^{***}	0.379
Alcohol use	0.188 ^{***}	0.051	0.736 ^{**}	0.320
Physical exercise	-0.068	0.055	-1.210 ^{***}	0.348
Education level	-0.019	0.015	-0.243 ^{***}	0.093
Occupation	-0.148 ^{***}	0.051	-1.002 ^{***}	0.314
Annual family income	-0.001 ^{***}	0.001	-0.001 [*]	0.001
Sample size	2225		1994	

***p < 0.01, **p < 0.05, *p < 0.1

Table 4 Relationship between social economic status and health

	Self-rated health		Mental health	
	Coefficient	Standard error	Coefficient	Standard error
Age	0.003	0.003	0.019	0.021
Gender	0.020	0.064	2.138 ^{***}	0.406
Residency	0.063	0.069	1.021 ^{**}	0.455
Marital status	0.011	0.059	-0.637 [*]	0.379
Smoking status	0.094	0.059	0.971 ^{**}	0.378
Alcohol use	0.182 ^{***}	0.050	0.738 ^{**}	0.319
Physical exercise	-0.053	0.055	-1.203 ^{***}	0.346
Type1	-0.640 ^{***}	0.096	-3.769 ^{***}	0.609
Type 2	-0.412	0.225	-1.825	1.428
Type 3	-0.286 ^{***}	0.092	-2.647 ^{***}	0.581
Type 4	-0.295	0.189	-2.263 [*]	1.183
Type 5	-0.227 [*]	0.118	-2.761 ^{***}	0.742
Type 6	-0.284	0.197	-2.875 ^{**}	1.232
Type 7	-0.177 ^{***}	0.065	-1.248 ^{***}	0.426
Sample Size	2226		1995	

***p < 0.01, **p < 0.05, *p < 0.1

Table 5 Relationship between social mobility and health

	Self-rated health		Mental health	
	Coefficient	Standard error	Coefficient	Standard error
Age	-0.004	0.003	-0.027	0.02
Gender	0.021	0.064	2.181 ^{***}	0.406
Residency	-0.056	0.070	1.055 ^{**}	0.456
Marital status	0.007	0.059	-0.716 [*]	0.379
Smoking status	0.104 [*]	0.060	1.021 ^{***}	0.378
Alcohol use	-0.184 ^{***}	0.051	-0.744 ^{**}	0.319
Physical exercise	-0.080	0.054	-1.377 ^{***}	0.342
Advantaged	-0.426 ^{***}	0.077	-3.054 ^{***}	0.495
Upward mobility	-0.159 ^{**}	0.062	-2.125 ^{***}	0.408
Downward mobility	0.122 [*]	0.150	1.806 [*]	0.944
Sample Size	2226		1995	

***p < 0.01, **p < 0.05, *p < 0.1