Original Article

Does Education and Interrupted Work Experience Help To Explain Why Childhood Health Is Related To Later Life Quality: Evidence from CHARLS

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Abstract

Background: China is experiencing rapid population aging. How to make sure prolonged longevity is accompanied by good quality of life needs to be investigated.

Methods: This study uses the China Health and Retirement Longitudinal Study (CHARLS) 2013 survey data to examine how different measures of later life quality are influenced by childhood health and mediated by education, interrupted work experience and other social economic factors. CHARLS is a nationally representative longitudinal survey of older people in China aged 45 years and over with detailed retrospective information on childhood health collected among more than 18, 000 individuals in 150 districts and 450 villages.

Results: The findings indicate that childhood health is significantly associated with all measures of later life quality, with education and interrupted work experience being the significant and important mediators.

Conclusion: The results can inform actions to improve life-long social and health equity by enhancing equal access to education and health resources and improving life-long continuous labour force participation, especially for vulnerable groups.

Keywords: Childhood health; later life quality; education; interrupted work experience; mediators; China

Introduction

China is experiencing rapid population aging, at a rate two to four times faster than that experienced in earlier decades by Western countries such as the US, Sweden and France. By year 2050, a projected 454 million Chinese will be aged 60 years old or above; further, the one-child policy introduced in the late 1970s will accelerate increases of the elderly dependency ratio to a projected range of 35 to 44% in 2050 [1, 2]. This population development is combined with the hope that the prolonged longevity is accompanied by good subjective quality of life, while this might not be the case, especially for those who experienced disadvantages in socio-economic and health circumstances since earlier life stages [3].

There are well established evidences supporting an overall relationship among health, lifelong socio-economic status (SES), and later life quality. Adverse experiences in early life have the ability to 'get under the skin" and affect future circumstances [3-5]. Consequently, health and wellbeing at later life can be established, maintained or improved through supportive socio-economic environments along with health-enhancing behaviours, financial and social resources, and reinforcing health promotion and services [6, 7]. While socioeconomic disadvantages can be passed from childhood to adulthood and later life [8, 9].

The most recent pathways model states that the impacts of early-life health and socio-economic status (SES) exposures on late-life outcomes are mostly indirect and could be mediated partially or fully by adult SES and health circumstances [10]. For instance, poor health in childhood leads to downward social mobility resulting lower adult SES hence poor health in late life [11]; The empirical life course studies are mainly for developed countries in Europe and North America using longitudinal surveys such as ELSA (UK), HRS (US), SHARE (EU) or Life Histories and Health Survey (AU) [3- 5, 11-15].

There are only a few studies for rapidly developing countries, such as China and India, due to the limitation of data which could be used for life course analyses. The most recent life course studies in China used the Chinese Longitudinal Healthy Longevity Survey (CLHLS) data of 23 provinces representing around 80% of older people aged 65 and plus in China [16-19], the China Health and Retirement Longitudinal Survey (CHARLS) 2008 pilot survey data of two provinces (Zhejiang and Gansu) [20], or the 2013 national survey data [7] for older people aged 45 and over living in communities in both urban and rural areas.

The studies based on CLHLS data, found strong evidences of linkages between childhood socioeconomic conditions and health /survival in later life [15-18]. It is found that (1) childhood nutrition, education, social engagements and receiving adequate medical service are significantly correlated with good cognitive ability; (2) urban residency, receiving adequate medical service, whether both parents alive at age 10, per capita GDP and social engagement are all significantly associated with ADL limitations; (3) urban residency and access to health care are significant predictors for self-reported health; (4) urban residency, whether both parents alive at age 10, childhood nutrition, economic independence, social engagement, religious involvement, regular exercise, and marital status are all correlated with survival or death.

Based on the two provinces pilot data of the CHARLS in 2008, [20] found strong associations between (1) childhood health and adult health outcomes for women, (2) childhood health and adult BMI for men, (3) adult height and per capita expenditure for both men and women.

Based on the CHARLS 2013 national data, [7] found that the childhood health, accounts for approximately half of the effect directly and another half of the effect indirectly through social and economic variations during adulthood. Relative living standard, marital status and urban residence are the most significant and important social and economic mediators for men; For women, living standard and secondary schooling are most influential while marital status is not significant.

This study contributes to the growing body of knowledge about life course study in China aiming to investigate the association between childhood health and later life quality as well as to address whether education and labour market interruption are important mediating factors that can explain the association between childhood health

and different measures of quality of later life. Our hypothesis is that those who had poor childhood health may also have had more disadvantages in education and labour market hence with negative consequences for later life quality.

This article is organized as follows. The next section outlines the research methods including the data source, statistical and modelling approaches and key variables appropriate to Chinese case. Findings are then presented describing how the early life health is associated with later life quality and how this association is modified by education and interrupted work experience and other life span socio-economic status (SES) and health behaviours. The discussion and conclusions interpret the findings within the Chinese cultural and policy context, and suggest directions for future research and policy development.

Methods

Data Source

The China Health and Retirement Longitudinal Survey (CHARLS) 2013 national data is used for this study. The CHARLS is a longitudinal survey conducted by the China Centre for Economic Research of Peking University. Face-to-face interviews in respondents' homes collected detailed information on demographic characteristics, socioeconomic status, health-related behaviours and health status (both childhood and current). In the first wave of CHARLS in 2011, older people aged 45 years or above living in China were randomly sampled using a multi-stage probability-proportional-to-size technique, stratified by regions and then by urban districts or rural counties and per capita gross domestic product. In the second wave in 2013, a total of 18,246 respondents aged 45 and plus were followed up and surveyed. Individual weights in the CHARLS data denoting the inverse of the probability that the observation is included because of the sampling design with household and individual non-response adjustment were used for the analyses. More details on the CHARLS survey design are available from [21].

Measurement

In our analysis, childhood health is the early life ex-

posure, self-rated health is the later life outcome, while education, interrupted work experience and other social and economic factors are the mediators, age and gender are the covariates with impact on exposures, mediators and outcomes. [22, 7].

Measures of later life quality

The quality of life among older people in developed countries is measured by multiple components, including psychological wellbeing, positive outlook, having health and functioning, social relationships, leisure activities, neighbourhood resources, adequate financial circumstance and independence etc [23].

The global ageing index measures wellbeing of old people in 4 domains (income security, health status, capacity and enabling environment). The overall index of wellbeing of aging population in China is ranking around 48 in the world, far behind the developed countries, such as Australia, Japan, US and UK, especially in the domains of income security and health status, though the capacity and enabling environment in China are not bad when compared to the developed countries [24] due to the filial piety culture [25].

Three measures of subjective later life quality are chosen in this study to reflect income security and health: (1) having average or above relative living standard to reflect income security; (2) self-reported general health to reflect having good health, functioning and independence; (3) life satisfaction to reflect psychological wellbeing.

In CHARLS, self-reported general health is based on respondents' answer to the question "Would you say your health is excellent, very good, good, fair and poor?" or "Would you say your health is very good, good, fair, poor and very poor?" We have combined the answers of these two questions into one scale "excellent, very good, good, fair, poor or very poor" and then regrouped them into two categories: "good health" and "not good health".

Life satisfaction is based on the respondents' answer to the question "Please think about your life-as-a-whole. How satisfied are you with it? Are you completely satisfied, very satisfied, somewhat satisfied, not very satis-

fied, or not at all satisfied?" We have regrouped the answers of this question into two categories: "satisfied" or "not satisfied".

In order to reflect the large variations existing across regions in economy and income, we use relative living standard instead of household absolute income or expenditure to measure financial status. The relative living standard is self-reported by asking the question "Compared to the average living standard of people in your city or county, how would you rate your standard of living, much better, a little better, about the same, a little worse, much worse?"

Measure of childhood health

The question on childhood health in CHARLS represents a retrospective self-evaluation on a five-point scale (excellent, very good, good, fair, or poor) of the general health before age 16 by asking "How would you evaluate your health during childhood, up to and including age 15?" We have regrouped the answers of this question into two categories: "good health" or "not good health".

Measures of mediating factors

The two major mediating factors to be examined in this study are individual educational achievement and whether having any interrupted work experience more than 12 months. Educational attainment has three categories: (1) under primary school, including illiterate or half illiterate, under primary or Sishu/home study; (2) schools without a degree, including middle and high schools as well as vocational education; and (3) college and above degrees, including college, bachelor, master and doctor degrees. Interrupted work experience is a good indicator for job security as most adults in China are supposed to work continuously.

The childhood SES is measured by father and mother's occupations and respondent's ethnicity. There are 5 occupational categories: Manager, professional or technician, worker, agricultural or fishery producer. Ethnicity is herniated from parents and refers to the 56 nationalities of which Han is the majority and the others are the minorities, such as Miao, Zhuang and Zhang etc. Parental information in CHARLS 2013 was asked and answered by respondents as their children.

The later life SES is measured by individual SES at the time of survey among older Chinese aged 45 and plus. Communist party membership might indicate some advantages in access to better socioeconomic resources (such as job opportunity and job promotion) as it is the only dominant party in China. Four marital statuses are used: (1) married with spouse present, including cohabitated; (2) married with spouse away (for job purpose); (3) separated, divorced or widowed; and (4) single or never married. The second group "married with spouse away" is used as a separated group here because some Chinese couples are living apart in different areas in order to meet their job commitment. Urban and rural residents have different access to social and economic development, health care and health information. The urban and rural areas are defined according to the most recently published statistical standard by the National Bureau of Statistics (NBS), where urban areas include both communities and villages located within the access to the city or town facilities, while rural areas include villages only out of the city or town facilities [26].

Healthy behaviours are measured by three variables: (1) current, former or never a smoker; (2) drinking alcohol more than once or less than once in a month or never; (3) having regular physical exercises defined as doing exercises as at least 3 days per week and more than 30 minutes per day, including moderate to vigorous physical activities and walking.

Health insurance is measured by having any form of insurance schemes as below: (1) government medical insurance; (2) urban employee basic medical insurance; (3) urban resident basic medical insurance; (4) new cooperative medical scheme in rural area; (5) private commercial medical insurance purchased by respondents' employers or by themselves; (6) other health insurance, including urban and rural resident medical insurance, medical aid, health insurance for severe illness etc.; or (7) no medical insurance.

Analytic approach

Both correlations and logistic regression models are used to examine how childhood health is correlated to different measures of later life quality, and whether education and interrupted work experience are significant medi-

ators that may explain the association between childhood health and later life quality. We first examine the relationships among childhood and different measures of later life quality, like what was done in Smith et al (2014). We then use the hierarchical additive estimation approach to run the binary logistic regression model, in which, early life exposure, two major mediators and other mediators are controlled for hierarchically [27, 22, 7].

Results

Sample characteristics

This study is based on a sample of 18, 246 completed respondents aged 45 years and over. Among the study population, about 33% are aged 45 to 54 years, 35% aged 55 to 64, 21% aged 65 to 74 and 10% aged 75 and plus. There are slightly fewer males than females. About three fourths report good later life and childhood health and one fourth with not good health. Around one third rate their relative living standard being at average level or above while two thirds with living standard lower than the average. The majority (86%) were satisfied with their late life and only 14% were not satisfied. Education attainment is relative low among older Chinese, with less than 3% having college or above degrees, and slightly less than half being illiterate or half illiterate. Only 5% report having interrupted work experience more than 12 months.

About one tenth of respondents are Communist party members, more than 90% are Han ethnic group, and 40% are living in urban areas. The majority (79%) are married and with spouse present, 6% married with spouse away, 14% divorced, separated or widowed and 1% never married. Among older people who have reported whether they have physical exercises, only less than half (48 %) of older people report having regular physical exercises. About 20% are current smokers and 10% former smokers. 26% drink alcohol more than once per month, 8% drink less than once per month and 66% do not drink. The majority of older people (89%) are covered by one of the three major medical insurance schemes (11.7% by Urban Employee Basic Medical Insurance (UEBMI), 5.2% by Urban Resident Basic Medical Insurance (URBMI) and 72.0% by New Cooperative Medical Scheme (NCMS). Another 7% by government, private or other types of health insurance, and still 4% without any medical insurance.

Correlations between childhood health, later life quality and major mediating factors

Table 1 examines the unconditional relationship between early life exposure (childhood health) and later life outcomes (quality of life). It provides the proportions of older people reporting good later life quality by their childhood general health before age 16. It shows that the proportions of respondents reporting good health, average or above relative living standard, being satisfied with later life decreased from 75.7%, 32.09%, 87.43%, respectively for respondents with excellent or very good childhood health to 64.34%, 26.14% and 80.56%, respectively for those with poor health.

Table1: Childhood health and later life quality.

Childhood health	Self-reported health	Relative living standard	Life satisfaction
	Good	Average or above	Satisfied
Excellent	75.70%	32.09%	87.43%
Very Good	73.61%	33.41%	86.89%
Good	72.16%	31.91%	86.31%
Fair	72.63%	28.92%	85.26%
Poor health	64.34%	26.14%	80.56%
All	72.62%	31.55%	86.06%
Data source: Authors' own calculation using CHARLS 2013.			

Table 2 examines the unconditional relationship between early life exposure (childhood health) and the two major mediating factors (education and interrupted work experience). It presents the proportions of older people with interrupted work experience more than 12 months or having middle schooling or above by childhood health. The proportion of having middle schooling or above decreases from respondents with excellent childhood health (60.81%) to those with poor childhood health (44.45%). While this is not the case for interrupted work experience.

People with either excellent or poor childhood health have a higher proportion reporting interrupted work experience (5.58% and 5.47%, respectively, when compared to the average (4.84%).

Table 2: Childhood health, education and interrupted work experience.

	Mediating factors	
	Interrupted work experience	Education
Childhood health	>12 months	Middle schooling or above
Excellent	5.58%	60.81%
Very Good	4.97%	57.18%
Good	4.16%	53.00%
Fair	4.86%	53.86%
Poor health	5.47%	44.45%
All	4.84%	54.97%
Data source: Authors' own calculation using CHARLS 2013.		

Table 3 examines the unconditional relationship between mediating factors (education and interrupted work experience) and later life outcomes (three measures of later life quality). It reports the proportions of older people with good later life quality by their education level and whether having any interrupted work experience more than 12 months. It shows that the proportions of older people reporting good health, average or above relative living standard, satisfied with later life increased by education level (From 65.46%, 26.01%, 83.31% to 89.55%, 67.11%, 93.81%, respectively). In addition, better later life quality outcomes are reported for those without interrupted work experience measured by good self-reported health, average or above relative living standard and satisfied with later life (73.10%, 31,75% and 86.39%, respectively), when compared to those with interrupted work experience (65.26%, 27.47% and 78.95%, respectively).

Table 3: Education, interrupted work experience and later life quality.

Mediating factors	Later life quality		
	Self-reported health	Relative living standard	Life satisfaction
	Good	Average and above	Satisfied
Without interrupted work experience >12 months	73.10%	31.75%	86.39%
With interrupted work experience >12 months	65.26%	27.47%	78.95%
Under primary school	65.46%	26.01%	83.31%
School without degree	77.98%	35.16%	87.95%
College and above	89.55%	67.11%	93.81%
All	72.61%	31.55%	86.02%
Data source: Authors' own calculation using CHARLS 2013.			

Regression results from the hierarchical additive estimation models

In the hierarchical additive logistic regression models, the different measures of later life quality are used as the dependent variables. The independent variables include age, gender and childhood health at first step, and then include education, interrupted work experience at second step, and other SES and health behaviour variables at last step. The other SES variables used for different dependent variables are different (see the notes under each table). They are chosen based on other empirical studies in China [16-19, 7]. Self-reported later life health is also controlled for in the estimation models of relative living standard and life satisfaction.

Table 4 presents the regression results on later life health. It is found that older people and females are less likely to report good later life health when compared to their counterparts. Good childhood health and higher

education significantly predict good later life health while having interrupted work experience predicts poor later life health. The estimated coefficient of childhood health is still significant but decreases once the education and interrupted work experience are controlled for in the model (from 0.146 to 0.114); while it becomes insignificant after con-

trolling for all variables, including early life SES (parental occupation, ethnicity), later life SES (relative living standard, communist party, marital status, urban or rural residence), healthy behaviours (smoking, drinking and regular physical exercise), and the type of medical insurance.

Table 4: Factors predicting self-reported health at later life.

	Model (1)		Model (2)		Model (3)	
DV=Later life health	Coefficients	P-value	Coefficients	P-value	Coefficients	P-value
Age	-0.027	0.000	-0.022	0.000	-0.018	0.000
Female	-0.418	0.000	-0.294	0.000	-0.234	0.014
Good childhood health	0.146	0.000	0.114	0.004	0.031	0.657
Interrupted work experience more than 12 months			-0.489	0.000	-0.330	0.019
School without degree			0.441	0.000	0.178	0.010
College and above			1.271	0.000	0.898	0.022
Other variables	No		No		Yes	
_cons	2.746	0.000	2.188	0.000	3.594	0.000
Data source: Authors' own calculation using CHARLS 2013.						

Note: Other variables in the model of health are: father and mother's occupation, ethnicity, urban/rural residence, communist party, marital status, relative standard living, insurance type, smoking, drinking, physical exercises.

Table 5: Factors predicting relative living standard at later life.

	Model (1)		Model (2)		Model (3)	
DV=Later life relative living standard	Coefficients	P-value	Coefficients	P-value	Coefficients	P-value
Age	0.001	0.474	0.009	0.000	0.008	0.010
Female	-0.086	0.023	0.074	0.067	0.079	0.166
Good childhood health	0.213	0.000	0.199	0.000	0.113	0.062
Interrupted work experience more than one year			-0.246	0.013	-0.189	0.142
School without degree			0.502	0.000	0.237	0.000
College and above			1.838	0.000	1.029	0.000
Other variables	No		No		Yes	
_cons	-0.981	0.000	-1.830	0.000	-1.272	0.000
Data source: Authors' own calculation using CHARLS 2013.						

Note: Other variables in the model of relative living standard are: father and mother's occupation, ethnicity, urban/rural residence, communist party, marital status, and later life health.

Table 5 presents the regression results on relative living standard at later life. It is found that both good childhood health and higher education have significantly positive and long-lasting influences on having average or above relative living standard as their estimated coefficients decrease but are still significant after we control for later life health and all SES variables_including-marital status, early life SES (parental occupation, ethnicity), later life SES (communist party, marital status, urban or rural residence) and later life general health. The estimated coefficient of interrupted work experience on relative living standard is significantly negative in the first model but it becomes insignificant in the third model after controlling for all SES variables and later life health.

Table 6 presents the regression results on later life satisfaction. It is found that females are less satisfied with their later life while life satisfaction increases by age. The estimated coefficient of female becomes insignificant while the estimated coefficient of age remained significant in the third model after controlling for all SES variables and later life health. Good childhood health significantly and positively predicts later life satisfaction. Its estimated coefficient decreases once the interrupted work experience, and education are controlled for in the second model; and it becomes insignificant in the third model after controlling for all other variables, including early life SES (parental occupation, ethnicity), later life SES (marital status, communist party, relative living standard, urban or rural residence), healthy behaviours (smoking, drinking and regular physical exercise), medical insurance and later life health. While both interrupted work experience, and middle schooling have decreasing and significant long-lasting influence on later life satisfaction, though the coefficient is negative for interrupted work experience, while positive for better education.

Table 6: Factors predicting life satisfaction at later life.

DV=Later life satisfaction	Model (1)		Model (2)		Model (3)	
	Coefficients	P-value	Coefficients	P-value	Coefficients	P-value
Age	0.017	0.000	0.024	0.000	0.033	0.000
Female	-0.344	0.000	-0.215	0.000	-0.048	0.697
Good childhood health	0.220	0.000	0.189	0.000	0.015	0.868
interrupted work experience more than one year			-0.538	0.000	-0.639	0.000
School without degree			0.452	0.000	0.166	0.062
College and above			1.116	0.000	0.175	0.685
Other variables	No		No		Yes	
_cons	0.849	0.000	0.189	0.284	0.4114085	0.613
Data source: Authors' own calculation using CHARLS 2013.						

Note: Other variables in the model of later life satisfaction are: father and mother's occupation, ethnicity, urban/rural residence, communist party, marital status, relative standard living, medical insurance type, smoking, drinking, physical exercises, and later life health.

Discussion and conclusions

This study provides a first-time national representative analyse in China aiming to explore the associations of childhood health with three different measures of later life quality, as well as to examine how education and interrupted work experience could mediate these associations using hierarchical additive approach and logistic regression model on CHARLS 2013 survey data. The findings indicate that childhood health is significantly associated with different measures of later life quality, and these relationships could be partly or fully mediated by life span SES and healthy behaviours.

It is found that, (1) good childhood health and better education have a positive while interrupted work experience has a negative influence on later life quality; (2) both education and interrupted work experience can only partially mediate the influence of childhood health on later life quality. (2) The influence of childhood health on relative living standard at later life is long-lasting while the influence of childhood health on later life self-reported general health and life satisfaction, can be fully mediated by education, interrupted work experience, together with other SES variables and healthy behaviours. (3) The influence of interrupted work experience on later life health and life satisfaction, and the influence of education on all the three measures of later life quality are long lasting and could only be partially mediated. (4) The influence of interrupted work experience on relative living standard could be fully mediated.

Our findings are generally consistent with broad literature on life course studies. For instance, childhood health is found to be associated with life-long SES and health, even net of social selection [28] education is the most important non-biological correlate of good health and higher social economic status [18, 29]; childhood circumstance are related to quality of life in older ages [3]. When compared to the previous studies in China, similar conclusions are drawn, including that there are strong associations between childhood health and later life health outcomes; Adulthood SES can mediate the impact of childhood health on later life health [17- 20, 7].

The unique contribution of our study is expanding later life health outcome to multiple measures of later life quality with focus on education and interrupted work experience as mediators. The findings of this study shed light on the importance of adopting a full life course approach and will deepen our understanding of how early interventions could influence later life quality in a rapidly ageing society of a middle-income country. The results can inform actions to improve life-long social and health equity by enhancing equal access to education and job opportunities and promoting life-long health and continuous labour force participation, especially for people with vulnerable background at birth [30].

CHARLS is an excellent longitudinal survey on China but our results should be interpreted with some caution as there are certain limitations which should be noted. Firstly, we have only used the cross-sectional associations to examine the life course predictors for later life quality without aiming to understand the underlying causality. Secondly, CHARLS is a representative community sample in urban and rural areas but it does not cover the about 1% older people living in an institution. Thirdly, the retrospective data on childhood health is inclined to have recall error though it is the best childhood health data we can have so far. Fourthly, CHARLS uses self-reported measures of relative living standard, general health status and life satisfaction which are more prone to measurement error than clinical or performance assessments. These measurement issues are particularly important considerations for those in rural areas with limited access to health professionals and health information and hence low awareness of health diagnosis criteria. Future research could be conducted by gender, regions and urban /rural residence.

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