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Evaluation of successful aging among older people in China: Results from China health and retirement longitudinal study

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Aim: China faces a “time-bomb” of the aging population. Successful aging has long been a goal in the field of gerontology. The present study aimed to evaluate successful aging among Chinese older adults.

Methods: Data on a total of 7102 people in the China Health and Retirement Study aged ≥ 60 years were analyzed in the present study. Successful aging is defined by the model of Rowe and Kahn including the following five indicators: “no major diseases,” “no disability,” “high cognitive functioning,” “high physical functioning” and “active engagement with life.” Using logistic regression analysis, crude and adjusted odds ratios with 95% confidence intervals were calculated to evaluate the relationship between sociodemographic parameters and successful aging.

Results: The prevalence of successful aging was 13.2% among Chinese older people. The percentage of older people with the five indicators, “no major diseases,” “no disability,” “high cognitive functioning,” “high physical functioning,” and “active engagement with life” was 41.7%, 92.1%, 54.2%, 70.2% and 46.0%, respectively. Multiple logistic regression showed people who had received education of high/vocational school or above had significantly greater odds of successful aging compared with those with less than primary school education ($P < 0.05$). The effect of education to college level or above on cognitive functioning was 2.51-fold higher in women than men ($P = 0.006$). Older people from a non-agricultural Hukou had 1.85-fold higher odds of successful aging than those from an agricultural Hukou. Older people living in the central, northeast or western regions had lower odds of successful aging relative to those living in the east coast region (0.72, 0.72 and 0.56, respectively).

Conclusions: The prevalence of successful aging is low among Chinese older people, and is affected by sociodemographic factors, such as education, Hukou and regions. **Geriatr Gerontol Int 2016; ●●: ●●–●●**

Keywords: aging, China, elderly, evaluation, successful.

Introduction

The world’s population has been aging rapidly. The proportion of the world’s population aged 60 years or older increased from 8% in 1950 to 12% in 2013. The Chinese population is one of the fastest aging populations in the world. According to a statistical communiqué of 2014 on the national economic and social development in China, the number of people aged ≥ 60 years was 212 million, accounting for 15.5% of the population. The proportion is estimated to increase rapidly to more

than 30% by 2050.¹ Population aging is leading to a shift towards a disease pattern dominated increasingly by chronic diseases and disabilities, with more complex health conditions, and exerting greater pressures on the health system and leading to increased costs.²

Successful aging has long been a goal in the field of gerontology, and it is of great interest in the arena of public health. Successful aging was discussed in terms of sociology and healthy psychology by Havighurst, who defined successful aging as “getting a maximum of satisfaction out of life.”³ The concept of successful aging was later redeveloped by Rowe and Kahn, who distinguished “successful aging” from “usual aging” as the absence of disease and disability, high cognitive functioning, and active engagement with life.^{4,5} Early studies of aging focused on one or two dimensions of this definition, such as the absence of chronic diseases, life satisfaction,

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physical functioning and social life engagement.^{6,7} However, more recent studies have defined successful aging as a multidimensional health status,^{8–10} which encompasses physical, functional, psychological and social health.¹¹ Successful aging as an optimal state implies more than physical well-being, and fits the World Health Organization's definition of health as a state of complete physical, mental and social well-being, rather than merely the absence of disease or infirmity. There is consensus with regard to the multidimensional nature of successful aging.^{8,12,13} However, agreement on the definition of successful aging or operationalized criteria has yet to be reached. The definition of successful aging varies among studies.¹² A review of 28 quantitative studies reported that there were 29 different definitions, and each varied in terms of components, measures and cut-offs on those measures. Recently, another review in 2014 revealed 105 definitions of successful aging.¹⁴ It is obvious that the greater the number of domains included, the more restrictive the definition of successful aging.

The model of successful aging put forth by Rowe and Kahn^{4,5} is widely accepted by researchers^{15,16}; it includes three components: (i) freedom from disability and disease; (ii) high cognitive and physical functioning; and (iii) active engagement with life. It provides a multidimensional, multi-indicator conceptualization of successful aging. According to this definition, the average prevalence of successful aging among older Europeans is 8.5%, ranging from 1.6% in Poland and 3.1% in Spain to 21.1% in Denmark.¹⁵ In the USA, 10.9% of the population met the criteria of successful aging in 2004, as reported by McLaughlin *et al.*¹⁶ In addition, there were different results about the association of sex with successful aging.^{15–17} Studies showed that sociodemographic status is an important factor related to health in old age, as is sex and education.^{18,19} Differences in sociodemographic status might be associated with social inequalities in successful aging. However, few studies come from China despite a soaring number of older people in this population. A better understanding of successful aging and associated factors should lead to more targeted strategies and responses to population aging in China. The present study evaluated successful aging as defined by Rowe and Kahn among a nationally representative sample of people aged ≥ 60 years in China.

Methods

Study design

The China Health and Retirement Longitudinal Study (CHARLS) aims to collect a high-quality, nationally representative sample of Chinese residents aged 45 years and older to enable research on older adults. It is based on the Health and Retirement Study in the USA, and related aging surveys such as the English Longitudinal Study of Aging and the Survey of Health, Aging and Retirement

in Europe. The pilot survey of CHARLS was carried out in two provinces in 2008, and returned high-quality data.^{20,21} The study was subsequently expanded to the national baseline survey carried out in 2011–2012. Ethics approval for the data collection was obtained from the Biomedical Ethics Review Committee of Peking University (IRB00001052-11015). Ethics approval for this study was obtained from the University of Newcastle HREC (H-2015-0290).

CHARLS uses multi-stage stratified probability-proportional-to-size sampling. The sample was stratified by province and within province by urban districts or rural counties, and by per capita statistics on gross domestic product. Included were 150 counties and 450 villages/resident committees in 28 provinces, and 17 708 individual participants were personally interviewed using a face-to-face computer-assisted process. Each participant signed an informed written consent form before the survey. The survey has been described in detail elsewhere.^{20–22} Of 7102 participants who were aged 60 years or older in the 2011 national baseline survey of CHARLS, 5667 had complete data about successful aging and were used in the present study, with 1435 were excluded because of missing data. The missing data were more likely to be female, older age, other marital status, lowly educated, more likely to live in an agricultural Hukou and reside in western China.

Definition of successful aging

Our criteria of successful aging, according to the definition of Rowe and Kahn, included the following five indicators: (i) no major diseases; (ii) no disability; (iii) high cognitive functioning; (iv) high physical functioning; and (v) active engagement with life.^{4,5,15,16} Participants who met all five indicator criteria fell in the category defined “successful aging.” The single indicator of successful aging was operationalized as follows.

- (1) No major diseases: CHARLS participants were asked if a doctor had told them that they had any of the following major chronic diseases: cancer, chronic lung disease, diabetes, heart disease and/or stroke. Depression was evaluated using the 10-item Center for Epidemiologic Studies Depression Scale. Respondents were classified as having no major disease if they neither reported any of the five chronic diseases nor obtained a score of more than 10 on the 10-item Center for Epidemiologic Studies Depression Scale, which has been identified as a valid, reliable and useful mental health assessment tool for older people in China.^{23,24}
- (2) No disability: Respondents were classified as having no disability if they did not report difficulties carrying out any of the six following activities of daily living: bathing, dressing, eating, indoor transferring, toileting or continence.

- (3) High cognitive functioning: Participants were considered to have high cognitive functioning if they achieved a median or higher score using the Telephone Interview for Cognitive Status. This includes both immediate and delayed recall of 10 words in a list, serial 7 subtraction from 100 (up to five times), and naming the day of the week, month, day, year and season. The scores of the Telephone Interview for Cognitive Status range from 0 to 30 (Cronbach's $\alpha=0.773$ in the present study).
- (4) High physical functioning: Participants were classified as having high physical functioning if they reported no difficulties with the five following activities: walking 100 m; getting up from a chair; lifting or carrying items weighing 5 kg; stooping, kneeling or crouching; and climbing several flights of stairs.
- (5) Active engagement with life: Respondents were defined as being actively engaged if they reported involvement in "voluntary or charity work," or having "provided help to family, friends or neighbors," or having "gone to a sport, social or other kind of club" in the month preceding the interview.

Other variables

Education level was allocated into three categories: primary school and below (illiterate; did not finish primary school, but capable of reading and/or writing; Sishu/home school; elementary school), high/vocational school (middle school, high school, vocational school), and college and above (2-/3-year college/associate degree, 4-year college/bachelor's degree, master's degree and doctoral degree). Marital status was allocated into two categories: married and other (separated, divorced, widowed and never married). Hukou, a household registration system in China, was used to categorize place of residence into agricultural and non-agricultural area (including unified residency Hukou). Based on the level of economic development, China can be divided into four major regions (east coast, central China, northeast China and western China).

Statistical analysis

Data analysis was carried out with SPSS 17.0 (SPSS, Chicago, IL, USA). Descriptive statistics were used to show the participants' sociodemographic characteristics. A χ^2 -test was used for the comparison of categorical variables. Multiple logistic regression analysis was applied to estimate the odds ratio (OR) for successful aging based on predictor variables. Analyses were also undertaken to assess interaction by sex as associations, and effects might be different for men and women because of their gender roles, and different risk exposures and responses. The significance threshold was $P < 0.05$.

Results

Table 1 shows the demographic characteristics of this sample. Information regarding 5667 (52.7% men and 47.3% women) participants aged ≥ 60 years included in the present study was obtained from data collected in the CHARLS baseline study. Of these participants, 83.5% were aged 60–74 years and 16.5% were aged ≥ 75 years. There were 78.8% older people with primary school and below education, 12.9% with high/vocational school education, and 8.3% with college or higher education. The total number of participants living in the east coast, central, northeast, and western regions was 1702 (30.0%), 1650 (29.1%), 648 (11.4%) and 1667 (29.4%), respectively.

The prevalence of "successful aging" was 13.2% among older people. As shown in Table 2, there was substantial variation in the prevalence of successful aging across demographic subgroups. Generally, a higher proportion of people aged 60–74 years were classified as successful aging compared with those who were aged ≥ 75 years (14.5% vs 6.2%, $P < 0.001$). A higher proportion of men were classified as successful aging than women (16.2% vs 9.7%, $p = 0.001$). The prevalence of successful aging was 10.0% for those with primary school education and below, 23.7% for those with high/vocational school education, and 26.9% for those with college or higher

Table 1 Characteristics of the study sample

Characteristics	<i>n</i>	%
Age group (years)		
60–74	4734	83.5
≥ 75	933	16.5
Sex		
Male	2989	52.7
Female	2678	47.3
Marital status		
Married	1151	20.3
Other marital status	4516	79.7
Education		
Primary school and below	4463	78.8
High/vocational school	733	12.9
College and above	469	8.3
Hukou (household registration system)		
Agricultural	4141	73.1
Non-agricultural	1522	26.9
Region		
East coast	1702	30.0
Central China	1650	29.1
Northeast China	648	11.4
Western China	1667	29.4

Table 2 Prevalence of successful aging and each indicator by characteristics

Characteristics	Successful aging	No major diseases	High cognitive functioning	High physical functioning	No disability	Active engagement with life
Total	746 (13.2)	2365 (41.7)	3072 (54.2)	3979 (70.2)	5218 (92.1)	2608 (46.0)
Age group (years)						
60–74	688 (14.5)	2021 (42.7)	2773 (58.6)	3481 (73.5)	4427 (93.5)	2178 (46.0)
≥75	58 (6.2)	344 (36.9)	299 (32.0)	498 (53.4)	791 (84.8)	430 (46.1)
Sex						
Male	485 (16.2)	1387 (46.4)	1881 (62.9)	2285 (76.4)	2771 (92.7)	1381 (46.2)
Female	261 (9.7)	978 (36.5)	1191 (44.5)	1694 (63.3)	2447 (91.4)	1227 (45.8)
Marital status						
Married	659 (14.6)	1962 (43.4)	2614 (57.9)	3261 (72.2)	4186 (92.7)	2061 (45.6)
Other marital status	87 (7.6)	403 (35.0)	458 (39.8)	718 (62.4)	1032 (89.7)	547 (47.5)
Education level						
Primary school and below	446 (10.0)	1787 (40.0)	2065 (46.3)	3005 (67.3)	4080 (91.4)	1942 (43.5)
High/vocational school	174 (23.7)	364 (49.7)	600 (81.9)	585 (79.8)	692 (94.4)	370 (50.5)
College and above	126 (26.9)	213 (45.4)	406 (86.6)	388 (82.7)	444 (94.7)	296 (63.1)
Hukou (household registration system)						
Agricultural	423 (10.2)	1712 (41.3)	1947 (47.0)	2803 (67.7)	3799 (91.7)	1752 (42.3)
Non-agricultural	323 (21.2)	651 (42.8)	1123 (73.8)	1173 (77.1)	1415 (93.0)	855 (56.2)
Region						
East coast	286 (16.8)	839 (49.3)	1008 (59.2)	1211 (71.2)	1577 (92.7)	882 (51.8)
Central China	209 (12.7)	664 (40.2)	887 (53.8)	1143 (69.3)	1532 (92.8)	740 (44.8)
Northeast China	82 (12.7)	222 (34.3)	407 (62.8)	420 (64.8)	576 (88.9)	339 (52.3)
Western China	169 (10.1)	640 (38.4)	770 (46.2)	1205 (72.3)	1533 (92.0)	647 (38.8)

Data presented as *n* (%).

education. A higher percentage of older people from non-agricultural Hukou (21.2%) than agricultural (10.2%) Hukou were classified as aging successfully ($P < 0.001$). People living in the east coast region had the highest prevalence of successful aging (16.8%), whereas those living in the western region had the lowest prevalence (10.1%).

Table 2 shows the proportions of older people meeting each indicator of successful aging. The percentage of older people reporting “no major diseases,” “no disability,” “high cognitive functioning,” “high physical functioning,” and “active engagement with life” was 41.7%, 92.1%, 54.2%, 70.2% and 46.0%, respectively. Specific indicators of successful aging classified by age groups, sex, marital status, education levels, Hukou and the four socioeconomic regions of China are summarized in Table 2.

To account for the role of sociodemographic factors in individuals’ opportunities for successful aging, we estimated a multivariate logistic model for successful aging. As shown in Table 3, relative to the older people aged 60–74 years, the odds of successful aging were 59% lower for those aged ≥75 years. In the crude model, women had lower odds of successful aging than men. After adjusting for education, however, the differences were smaller and failed to reach statistical significance. In the final model, people with other marital status had significantly lower

odds of successful aging (OR 0.69, 95% CI 0.54–0.88) relative to married people. Compared with those with less than primary school education, older people with education of high/vocational school or above had significantly greater odds of aging successfully ($P < 0.001$). After controlling for education level, the odds of successful aging in a non-agricultural Hukou relative to an agricultural Hukou were observed to decrease by 31.2% from 2.37 to 1.63. People living in the central, northeast, and western regions had 0.72-, 0.72- and 0.56-fold the odds of successful aging relative to those living in the east coast region, respectively.

The multivariate logistic models also show specific indicators of successful aging by characteristics (Table 4). In comparison with those aged 60–74 years, older people aged ≥75 years had lower odds of all specific indicators except for “active engagement with life.” The odds were lower for women than for men for “no major diseases,” “high cognitive functioning” and “high physical functioning” (OR 0.71, 95% CI 0.64–0.79; OR 0.55, 95% CI 0.49–0.61; OR 0.57, 95% CI 0.50–0.64, respectively). Compared with married people, those with other marital status had significantly lower odds of “high cognitive functioning” and “no major diseases,” but greater odds of “active engagement with life” (OR 1.17, 95% CI 1.02–

Table 3 Multiple logistic regression for successful aging

Characteristics	Model 1 OR (95% CI)	Model 2 OR (95% CI)	Model 3 OR (95% CI)
Age group (Ref. = 60–74 years)			
≥75 years	0.39 (0.30–0.52)***	0.43 (0.32–0.57)***	0.41 (0.31–0.55)***
Sex (Ref. = male)			
Female	0.56 (0.48–0.66)***	0.67 (0.56–0.78)	0.67 (0.56–0.79)***
Marital status (Ref. = married)			
Other marital status	0.48 (0.38–0.61)***	0.54 (0.43–0.69)***	0.69 (0.54–0.88)**
Education level (Ref. = primary school and below)			
High/vocational school	2.80 (2.30–3.41)***	-	1.98 (1.60–2.45)***
College and above	3.31 (2.64–4.15)***	-	1.90 (1.46–2.48)***
Hukou (Ref. = agricultural)			
Non-agricultural	2.37 (2.02–2.78)***	1.63 (1.35–1.96)***	1.85 (1.53–2.23)***
Region (Ref. = east coast)			
Central China	0.72 (0.59–0.87)**	0.72 (0.59–0.88)**	0.68 (0.56–0.83)***
Northeast China	0.72 (0.55–0.93)*	0.59 (0.45–0.77)***	0.53 (0.40–0.70)***
Western China	0.56 (0.46–0.69)***	0.60 (0.49–0.74)***	0.59 (0.48–0.73)***

* $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$. Multiple logistic regression analysis was applied to estimate the odds ratio (OR) for successful aging in predictor variables. Model 1: crude model; model 2: adjusted for education level; model 3: adjusted for age group, gender, marital status, education level, Hukou and region. Ref., reference.

Table 4 Multiple logistic regression for each indicator of successful aging by characteristics

Characteristics	No major diseases OR (95% CI)	High cognitive functioning OR (95% CI)	High physical functioning OR (95% CI)	No disability OR (95% CI)	Active engagement with life OR (95% CI)
Age group (Ref. = 60–74 years)					
≥75 years	0.82 (0.70–0.95)**	0.32 (0.27–0.38)***	0.42 (0.36–0.49)***	0.40 (0.32–0.50)***	0.94 (0.81–1.10)
Sex (Ref. = male)					
Female	0.71 (0.64–0.79)***	0.55 (0.49–0.61)***	0.57 (0.50–0.64)***	0.91 (0.74–1.11)	1.02 (0.91–1.14)
Marital status (Ref. = married)					
Other marital status	0.81 (0.70–0.94)**	0.74 (0.64–0.86)***	0.91 (0.78–1.05)	0.91 (0.72–1.16)	1.17 (1.02–1.34)*
Education level (Ref. = primary school and below)					
High/vocational school	1.37 (1.15–1.62)***	3.31 (2.69–4.07)***	1.43 (1.16–1.75)**	1.37 (0.97–1.95)	1.14 (0.96–1.34)
College and above	1.12 (0.90–1.40)	3.73 (2.77–5.02)***	1.57 (1.19–2.07)**	1.47 (0.93–2.34)	1.65 (1.33–2.06)***
Hukou (Ref. = agricultural)					
Non-agricultural	1.00 (0.87–1.15)	2.23 (1.91–2.61)***	1.52 (1.29–1.78)***	1.16 (0.90–1.51)	1.48 (1.29–1.70)***
Region (Ref. = east coast)					
Central China	0.68 (0.59–0.78)***	0.72 (0.62–0.84)***	0.86 (0.74–1.00)	0.97 (0.74–1.26)	0.76 (0.66–0.87)***
Northeast China	0.51 (0.42–0.62)***	0.79 (0.64–0.97)*	0.60 (0.49–0.74)***	0.55 (0.40–0.75)***	0.88 (0.74–1.07)
Western China	0.65 (0.56–0.74)***	0.58 (0.50–0.67)***	1.06 (0.91–1.24)	0.88 (0.68–1.14)	0.60 (0.53–0.69)***

* $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$. Multiple logistic regression analysis was applied to estimate the odds ratio (OR) for successful aging in predictor variables. The model is adjusted for age group, gender, marital status, education level, Hukou and region. Ref. = reference.

1.34). Relative to those with less than primary school education, older people with education at high/vocational school or above had significantly greater odds of “high

cognitive functioning,” “high physical functioning” and “active engagement with life” ($P < 0.05$). Older people from non-agriculture Hukou had significantly greater

odds of “high cognitive functioning,” “high physical functioning” and “active engagement with life” than those from an agricultural Hukou. Compared with those living in the east coast region, people living in the central region had lower odds of all specific indicators except for “no disability” and “high physical functioning”; those living in the northeast region had lower odds of all specific indicators except for “active engagement with life”; and those living in the western region had lower odds of “no major diseases,” “high cognitive functioning” and “active engagement with life.”

To further determine whether education has a different effect on successful aging and each indicator between men and women, we also tested for interaction between education and sex (Table 5). A statistically significant difference was observed in the effect of education on cognition between men and women. Compared with primary school education and below, the effect of education of college or above on cognitive functioning was 2.51-fold higher in women than men ($P=0.006$).

Discussion

We evaluated the prevalence of successful aging among Chinese adults aged 60 years or older, following Rowe and Kahn's multidimensional model of successful aging. The findings showed that 13.2% of older people met the successful aging criteria. The prevalence was higher than in Europe with 8.5%,¹⁵ and in the USA with 10.9% in 2004 reported by McLaughlin *et al.*¹⁶ This discrepancy is likely related to “high physical functioning” with 70.2% in China, 57.3% in Europe and 49.0% in the USA, and “no disability” with 92.1%, 83.7% and 82.1, respectively. There was a higher prevalence of obesity among older adults in Western countries than China. The a combination of muscle loss and fat gain might act synergistically to increase the risk of physical disability in obese older adults.^{25,26} However, this proportion is much lower than the 46.2% in Shanghai reported by Li *et al.*, following the four dimensions model of successful aging including cognitive function, activities of daily living, mood status and no disability.²⁷ This discrepancy is likely related to different components in the model of successful aging; that is, we considered chronic diseases, the leading causes of death globally, in the present study, whereas these were not taken into account in the research by Li *et al.*

The prevalence of successful aging varies with different sociodemographic factors. The prevalence of successful aging and its five indicators decreases as the individual ages. The incidence of chronic diseases, disability, impaired cognition and so on increases with age.²⁸ Promoting successful aging in younger generations can contribute to successful aging in elderly populations.²⁹ People with higher educational level and those currently married can expect a higher rate of successful aging (Table 2).²⁷ Education can influence health by enhancing

Table 5 Effect of the interaction between sex and education on successful aging and each indicator

Characteristics	Successful aging OR (95% CI)	No major diseases OR (95% CI)	High cognitive functioning OR (95% CI)	High physical functioning OR (95% CI)	No disability OR (95% CI)	Active engagement with life OR (95% CI)
Sex (Ref. = male)						
Female	0.63 (0.52–0.78)***	0.72 (0.63–0.81)***	0.52 (0.45–0.58)***	0.58 (0.51–0.66)***	0.91 (0.73–1.13)	1.00 (0.89–1.13)
Education level (Ref. = primary school and below)						
High/vocational school	1.96 (1.53–2.50)***	1.42 (1.16–1.73)**	2.96 (2.31–3.81)***	1.57 (1.21–2.03)**	1.50 (0.97–2.31)	1.14 (0.93–1.39)
College and above	1.70 (1.25–2.30)**	1.09 (0.85–1.41)	2.85 (2.07–3.98)***	1.50 (1.08–2.09)*	1.35 (0.80–2.27)	1.52 (1.18–1.96)**
High/vocational school × female	1.01 (0.65–1.58)	0.88 (0.62–1.24)	1.37 (0.89–2.10)	0.78 (0.52–1.17)	0.78 (0.39–1.56)	0.99 (0.70–1.39)
College and above × female	1.52 (0.91–2.52)	1.10 (0.71–1.70)	2.51 (1.30–4.82)**	1.13 (0.66–1.92)	1.39 (0.53–3.67)	1.36 (0.87–2.14)

*** $P < 0.01$, ** $P < 0.001$. Multiple logistic regression analysis was applied to estimate the odds ratio (OR) for successful aging. The model is adjusted for age group, sex, marital status, education level, Hukou and region. Ref., reference.

a person's financial status, which provides more resources for maintaining good health, and by increasing a person's knowledge, ability and skills to achieve better health.³⁰ In the present study, people with education at the level of high/vocational school and above had three-fold odds of "high cognitive functioning," compared with those educated at primary school and below. Education might also contribute to successful aging by enhancing cognitive development and intellectual abilities.³¹

There are inconsistent results about the association of sex with successful aging. Strawbridge *et al.* found that a substantially higher percentage of women than men met Rowe and Kahn's definition.¹⁷ However, McLaughlin *et al.* reported that men had greater odds of successful aging than women.¹⁶ Although sex might strongly relate to longevity, women typically report more chronic conditions than men, have more functional limitations and experience more disability.³² Furthermore, most studies did not take into account the effect of mortality, and only provided insight into factors that influence successful aging among survivors in current cross-sectional analyses. In the present study, we observed a sex difference in successful aging. After controlling for education levels, the difference decreased, but still remained statistically significant. A difference in education levels was observed between men and women in the present study, with women having received much less education than men. Investments and policies that help close gender disparities in education could improve women's successful aging, especially with regard to cognition.³³ Furthermore, there is a significant education–female interaction on cognition, indicating that education to college and above is extremely important for women's cognitive functioning. In subsequent generations, women are better educated and this promises better outcomes for China's future older population.³⁴

In China, Hukou, a household registration system, is categorized into agricultural Hukou and non-agricultural Hukou. In the present study, we observed that people from a non-agricultural Hukou had greater prevalence of successful aging than those from an agricultural Hukou. The biggest differences between the two groups were found in "high cognitive functioning," "high physical functioning" and "active engagement with life." This discrepancy might be associated with inequality in access to basic public services (e.g. education, healthcare etc.) between agricultural Hukous and non-agricultural Hukous. Generally, people from non-agricultural Hukous have more and better opportunities to acquire basic public services compared with those from agricultural Hukous.³⁵ In the present study, 89.8% of participants received education at primary school level or below, 8.7% had high/vocational school education and 1.5% were educated at college or a higher institution in agricultural Hukous, whereas the corresponding figures in non-agricultural Hukous were 48.8%, 24.5% and 26.7%, respectively. When we adjusted for the education levels,

the odds of successful aging in non-agricultural Hukous relative to agricultural Hukous decreased. Inequality in education is partly responsible for the discrepancy of successful aging based on Hukou.

China is a developing country with a vast territory. Different regions have different geographical, economic, cultural and social conditions, and also have different successful aging levels among older people. People living in the east coast region had the highest prevalence of successful aging, and those living in the western region had the lowest prevalence. This is closely associated with better development in the economy and social conditions at the east coast relative to other regions. Many people in the remote and resource-poor areas in the western regions still have consumption levels below a dollar a day, often without access to clean water, arable land or adequate health and educational services.³⁶

In summary, the prevalence of successful aging is low among older people in China. Most older adults depend heavily on their extended family for providing long-term care, especially in rural areas. Nevertheless, traditional family support networks are weakening as the population ages and family size declines. Furthermore, there is a limited institutional care system. China is facing a huge challenge with the aging of its population, and should take targeted actions for improvement in successful aging to prolong healthy life of older people in China.

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Disclosure statement

The authors declare no conflict of interest.

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