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## Self-Rated Health among Older Adults: A comparison of China and the United States

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## Self-Rated Health among Older Adults: A comparison of China and the United States

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## ABSTRACT

**Objectives:** We used recent, large, and nationally representative samples of China and the US older population to investigate: 1) whether factors influencing self-rated health among older Chinese were similar to those among older Americans; and 2) whether there was a significant cross-national difference on self-rated health between China and the US after controlling those available influencing factors.

**Design:** A cross-sectional study. Data came from the 2014 Health and Retirement Study (HRS) and China Health and Retirement Longitudinal Study (CHARLS) conducted from 2014 through 2015.

**Participants:** Our final sample size totaled 8,905 older adults in the US and 4,442 older adults in China.

**Outcome:** The response variable was self-rated health. Ordered logistic regression models were conducted to investigate factors influencing self-rated health among older adults.

**Results:** More than three fourths (78%) of older adults in China reported fair or poor health status, while almost 74% of older adults in the US reported excellent, very good or good health status. In the overall ordered logistic regression model, when controlling statistically for sociodemographics, family structure, functional limitations, cognition, chronic conditions, mental health, and health-related behaviors, the Chinese survey respondents were much more likely to rate their health as being poorer than the US respondents. The odds of having the combined “good”, “very good”, or “excellent” health versus “fair” or “poor” health was almost 5 times greater in American older adults than those in China (OR=4.88, 95% CI: 4.06-5.86).

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3 **Conclusions:** We found a striking difference in self-rated health between China and the US even  
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5 after controlling for measures of disease, functional status, and other influencing factors.  
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8 Relative to their American counterparts, Chinese elders were much more likely to report worse  
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10 health.  
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16 **Keywords:** self-rated health, older adults, China, the United States, living arrangement  
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### 21 22 **Strengths and limitations of this study** 23

- 24  
25 • We used recent, large, and nationally representative samples of China and the US older  
26  
27 population to investigate self-rated health.  
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30 • With the global aging of the population, this study of cross-national comparison provides  
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32 a unique perspective to gain knowledge on the similarities and differences in older adults'  
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34 self-rated health.  
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37 • Some variables such as drinking behavior, currently working, and education level were  
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39 not exactly the same questions surveyed in China and the US, although they were defined  
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41 as closely as possible in our harmonized datasets.  
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44 • More information on health literacy, access to health services would be beneficial for  
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46 further examining the differences in self-rated health among older adults between the US  
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48 and China.  
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## INTRODUCTION

Self-rated health measures the subjective perception of an individual's overall health status and is an important and robust predictor of health outcomes among older adults, such as disability, morbidity, and mortality.<sup>1-4</sup> Predictors of self-rated health include demographic, cognitive, physical, social, and mental factors.<sup>4-7</sup>

Although previous research has demonstrated many factors influencing self-rated health in the older population, these studies are largely limited to samples in one country, not international populations. With the global aging of the population, cross-national comparison provides a unique perspective to gain knowledge on the similarities and differences in the aging experience. China and the US present interesting comparative examples to policymakers and researchers to identify factors influencing older adults' self-rated health. These two countries have shown similar trends in aging and health. More people are living longer with multiple chronic conditions, and cardiovascular disease, lung disease, cancer, and stroke have become the leading causes of death.<sup>8</sup> Meanwhile, China and the US may have different patterns in demographics and health risk factors. For example, in 2015, the 80-and-older population in the US represented 25.3 percent of its older population, while the share was 18.2 percent in China.<sup>8</sup> The prevalence of hypertension is higher in the US.<sup>9</sup> Moreover, the family and sociocultural environments may play different roles in health and aging in these two countries. For example, filial piety, which is a virtue of obedience, respect, and care for one's parents and elders, is an essential value in Chinese culture.<sup>10</sup> The traditional concept of "raising children for the purpose of being cared in old age" is still prevalent.<sup>11</sup> Social life is mainly family oriented and older adults give high priority to close kin relations and familial interests.<sup>12, 13</sup> Unlike in China, individuality and independence are highly valued in the US and children are encouraged to be independent and

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3 leave home as soon as possible.<sup>14</sup> Another important difference between Chinese and American  
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5 is the way they view humility. Humility is a revered virtue in China<sup>10, 15</sup> while in the US humility  
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7 may be considered as a sign of weakness.<sup>14</sup> A recent study indicated there was a negative  
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9 association between humility and better self-rated health.<sup>16</sup> Older adults' perception of health is  
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11 contingent on their sociocultural context in which they are embedded.<sup>3</sup> Therefore, it is  
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13 particularly important to understand how factors including demographics, health patterns, family  
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15 and sociocultural environments influence self-rated health among older adults in China and the  
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17 US.  
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22 We used recent, large, and nationally representative samples of China and the US older  
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24 population to investigate: 1) whether factors influencing self-rated health among older Chinese  
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26 were similar to those among older Americans, and 2) whether there was a significant cross-  
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28 national difference on self-rated health between China and the US after controlling those  
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30 available influencing factors.  
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## 34 **METHODS**

### 35 **Data and Samples**

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37 Data for this study came from the 2014 Health and Retirement Study (HRS) and China Health  
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39 and Retirement Longitudinal Study (CHARLS) conducted from 2014 through 2015. The HRS is  
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41 a longitudinal study of individuals over age 50 in the US, which collects information about  
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43 demographics, cognition, health, family structure, health care utilization, and insurance. The  
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45 CHARLS is a national longitudinal study of Chinese aged 45 years and older, which is designed  
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47 to be comparable with the HRS in the US. This study uses information from the RAND HRS and  
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3 the Harmonized CHARLS datasets. The Harmonized CHARLS dataset, created by the Gateway  
4 to Global Aging Data, consists of variables defined as closely as possible to the RAND HRS.  
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8 Our samples include respondents aged 65 years and older at the time of the surveys who  
9 provided full information on all analysis variables. Our final sample size totaled 8,905 older  
10 adults in the US and 4,442 older adults in China.  
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## 15 **Measures**

### 16 *Self-rated health*

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18 Respondents were asked to self-report their current general health status using a scale ranging  
19 from 1 for poor to 5 for excellent.  
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### 22 *Sociodemographic and family structure variables*

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24 Sociodemographic variables consisted of age, gender, educational level, and employment  
25 (currently working). Family structure variables included living arrangement and number of  
26 children. Regarding educational level, the three categories in the US were: less than high school,  
27 high-school graduate, and some college or college and above; the three categories in China were:  
28 less than lower secondary, upper secondary and vocational training, and tertiary education. The  
29 question about currently working in the US survey asked the respondents “are you doing any  
30 work for pay at the present time”. In contrast, the question in the Chinese survey indicated not  
31 only the paid work but also the unpaid family business and the time span is specific to the last  
32 year, rather than the present time. Living arrangements were defined into three groups: living  
33 alone, living with spouse or partner (regardless of whether they also lived with others), and  
34 living with others without spouse or partner.  
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### *Functional limitations*

An activities of daily living (ADLs) summary score was derived from respondent's report of any difficulty in bathing, dressing, and eating. The summary score ranged from 0 to 3, with higher scores indicating more functional limitations. An instrumental activities of daily living (IADLs) binary variable indicated whether respondents reported difficulty in using the phone, managing money, or taking medications.

### *Cognition*

Self-reported memory was evaluated using a scale ranging from 1 for excellent to 5 for poor. A total recall summary score counted the number of words respondents could recall correctly from a list of 10 different words both immediately and later in the survey. The score ranged from 0 to 20 with higher scores indicating better word recall.

### *Chronic conditions and mental health*

Respondents reported whether or not having been told by a doctor he/she had a specific condition. There were 8 chronic conditions including high blood pressure, diabetes, cancer, lung disease, heart problem, stroke, psychiatric problems, and arthritis. Mental health score was a sum of 6 questions related to respondent's feeling during the past week: felt depressed, felt everything was an effort, sleep was restless, felt happy, felt lonely, and felt he or she could not get going. After reverse coding whether the respondent felt happy, the sum score ranged from 0 to 6 with higher scores indicating that the respondent felt more negative feelings.

### *Health-related behaviors*

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3 Health-related behavioral questions included if he/she drank and smoked in the past. Unlike the  
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5 HRS, the CHARLS asked drinking behavior in a longer time period (1 year).  
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## 8 **Statistical Analysis**

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11 A set of chi-square or t-tests were used to evaluate the statistical significance of differences  
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13 between the US and China. Ordered logistic regression models were conducted to investigate  
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15 factors influencing self-rated health among older adults in the US and China respectively. In the  
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17 full ordered logistic regression model, a country variable (the US vs. China) was added to further  
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19 investigate whether there was a significant difference in self-rated health between US and China  
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21 after controlling sociodemographics (age, gender, educational level, currently working), family  
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23 structure (living arrangements, number of children), functional limitations (ADLs and IADLs),  
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25 cognition (self-reported memory, a total recall summary score), chronic conditions (high blood  
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27 pressure, diabetes, cancer, lung disease, heart problem, stroke, psychiatric problems, and  
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29 arthritis), mental health, and health-related behaviors (ever drinking and ever smoking). A test of  
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31 proportional odds assumption was performed; demonstrating the assumption did not hold across  
32  
33 the five-category self-rated health variable. A generalized ordered logistic model yielded similar  
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35 results, indicating that the estimated difference in self-rated health between the US and China  
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37 were not influenced by violations of the proportional odds assumption. In sensitive analyses, we  
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39 categorized age (65-74, 75-84, and 85+.) and number of children (0, 1, 2, and 3+ children) and  
40  
41 our results remained the same. We also repeated the analyses using the 2012-2013 HRS and  
42  
43 CHARLS data sets and found similar results. All estimates were population weighted and  
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45 standard errors adjusted for complex survey design. All statistical analyses were performed using  
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47 Stata 14.1. Statistical significance was accepted at the  $p < 0.05$  level.  
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## Patient and Public Involvement

This study did not involve patients and the public.

## RESULTS

Population-weighted characteristics of older adults in the US and China are presented in Table 1.

Compared to the US population, older adults in China were younger by 2.4 years on average, had higher proportions of male, married/partnered, less educated, and currently working. More than 73% of older Chinese lived with a spouse or partner, 10% lived alone, and 17% lived with others without a spouse or partner; while 59% of older Americans lived with a spouse or partner, 30% lived alone, and 11% lived with others without a spouse or partner. Older adults in China had a higher average number of living children than those in the US. Older Chinese reported having more IADLs limitations relative to older Americans; however, the difference in ADLs limitations was small. Older Chinese reported a lower proportion of chronic conditions ever told by a doctor including high blood pressure, diabetes, cancer, heart problem, stroke, psychiatric problems, and arthritis, and a higher proportion of lung disease than older Americans. Older Chinese had worse mental health and worse cognition including self-reported memory and total recall summary score, compared to older Americans.

Regarding factors influencing self-rated health among older adults, we found similar results in China and the US (Table 2). As expected, older adults who had more ADLs limitations, poorer self-reported memory, worse mental health, and chronic health conditions, had lower self-rated health. Factors including gender, number of living children, IADLs limitations, and ever smoking were not associated with self-rated health in these two countries.

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3 On the other hand, some factors had different associations with self-rated health between China  
4 and the US (Table 2). Older adults in China living alone rated their health better than those living  
5 with spouse/partner; however, no significant difference was found between these two living  
6 arrangements in older Americans. In contrast, older adults in the US living with others rated their  
7 health worse compared to those living with spouse/partner. In addition, age, currently working,  
8 educational level, recall summary score, and ever drinking had positive associations with self-  
9 rated health in older Americans, however, no significant associations were found in older  
10 Chinese.  
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22 More than three fourths (78%) of older adults in China reported fair or poor health status, while  
23 almost 74% of older adults in the US reported excellent, very good or good health status (Table  
24 1). In the overall ordered logistic regression model (Table 2), when controlling statistically for  
25 sociodemographics, family structure, functional limitations, cognition, chronic conditions,  
26 mental health, and health-related behaviors, the Chinese survey respondents were much more  
27 likely to rate their health as being poorer than the US respondents. The odds of having the  
28 combined “good”, “very good”, or “excellent” health versus “fair” or “poor” health was almost 5  
29 times greater in American older adults than those in China (OR=4.88, 95% CI: 4.06-5.86, Table  
30 2). We tested the sensitivity of our model using the 2012-2013 HRS and CHARLS data sets and  
31 found similar results (OR=5.86, 95% CI: 4.88-7.03, data not shown).  
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## 46 **DISCUSSION**

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49 Using the recent, nationally representative samples of the older population, the study found both  
50 cross-national similarities and differences between China and the US. Many factors including  
51 gender, ADLs, IADLs, self-reported memory, chronic conditions (high blood pressure, cancer,  
52 lung disease, heart problem, stroke, psychiatric problems, and arthritis), mental health, ever  
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3 smoking and number of living children had consistent and similar associations with self-rated  
4 health in both China and the US.  
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8 On the other hand, family living arrangements appeared to play different roles in self-rated  
9 health among older people in these two countries. Independence and privacy is highly valued in  
10 American family; while in China living with adult children is more normative because they are  
11 expected to take care of their elders, and elder parents are expected to provide grandchild care.<sup>17</sup>  
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18 <sup>18</sup> This is supported by our findings. A much higher proportion of American elders lived alone  
19 than their Chinese counterparts (30% versus 10%), while a much higher proportion of Chinese  
20 elders lived with others with no spouse or partner present than their American counterparts (17%  
21 versus 11%). In the US, co-residence of older adults with others may indicate vulnerable health  
22 and need for live-in assistance.<sup>19</sup> We found that American elders living with others with no  
23 spouse or partner present reported worse health status than those in other living arrangements.  
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31 However, living with others did not signal a similar fragility of health in China. We found that  
32 Chinese elders living with others without spouse or partner reported similar health status  
33 compared to those living with spouse or partner, while Chinese elders living alone reported  
34 better health status. This may be explained by the two situations for Chinese elders living with  
35 others without spouse or partner. On the one hand, similar to the US elders, they were vulnerable  
36 and could not live alone. Thus, they had to live with others to receive the assistance they needed.  
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46 On the other hand, in China elders who have better health status may be called upon to provide  
47 grandchild care. It is not uncommon in China for elders to separate from their spouse or partner  
48 and live with their adult children to take care of their grandchild. In addition, there were no  
49 statistically significant differences by number of children in both China and the US. Our study  
50 suggests that the quality of parent-child relationships may matter most, not the quantity of  
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3 children. For example, a recent study found that anticipated support from children, the belief that  
4 children would provide support if needed, was associated with older parents' better self-rated  
5 health.<sup>20</sup> This may have important implications for China since the one-child policy has led to  
6 smaller family size and changes in family structure and relations.  
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11 We found a striking difference on self-rated health between China and the US even after  
12 adjusting all available influencing factors including sociodemographic, family structure,  
13 functional limitations, cognition, chronic conditions, mental health, and health-related behaviors.  
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15 Relative to their American counterparts, Chinese elders were much more likely to report worse  
16 health. There are several possible explanations for this finding. First, Chinese elders may have  
17 under-reported their chronic conditions; the prevalence of chronic conditions reported in this  
18 Chinese older adult sample was relatively low compared with previous studies.<sup>21-23</sup> Chinese older  
19 adults, especially those in rural areas, had limited access to health services and could not be  
20 diagnosed by physicians.<sup>24</sup> Second, older adults in China may not have understood the  
21 implications of their health conditions. Chinese elders had a lower education level relative to  
22 those in the US. It is reasonable to suspect that the health literacy was correspondingly low. Due  
23 to low health literacy, Chinese elders may have limited capacity to obtain, process, and  
24 understand health information and services, thus have poor self-management of chronic  
25 conditions.<sup>25</sup> Another possible explanation is the sociocultural context for self-rated health. In  
26 China, it is a virtue to be humble and modest,<sup>10</sup> and older adults may tend to downplay their own  
27 health. In contrast, older adults in the US may be reluctant to see their health as poor for fear of  
28 losing their independence or being a burden on others. Moreover, older adults may perceive  
29 "fair" in the scale of self-rated health measure is the midpoint of the scale with the meaning of  
30 average health status in Chinese culture. Our findings have important implications for cross-  
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3 national comparisons on self-rated health between the US and China, with the caution that older  
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5 adults' social and cultural contexts may shape their perceptions of health.  
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9 There were limitations in this study. First, although the data from the HRS and CHARLS  
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11 provided a unique opportunity to make country-by-country comparisons, it did not allow us to  
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13 examine certain factors influencing older adults' self-rated health in detail. More information on  
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15 health literacy, access to health services would be beneficial for further examining the  
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17 differences in self-rated health among older adults between the US and China. This provides  
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19 impetus to further data collection efforts. Second, some variables such as drinking behavior,  
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21 currently working, and education level were not exactly the same questions surveyed in China  
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23 and the US, although they were defined as closely as possible in our harmonized datasets. This  
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25 may have an effect on our results.  
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## 29 30 **CONCLUSION**

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33 Using the recent, nationally representative samples of the older population, we found a striking  
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35 difference in self-rated health between China and the US even after controlling for measures of  
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37 disease, functional status, and other influencing factors. Relative to their American counterparts,  
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39 Chinese elders were much more likely to report worse health.  
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## TABLES

Table 1 Sample characteristics

	China (Sample N=4,442) (Population N=98,355,397)	US (Sample N=8,905) (Population N=40,690,149)	P value
	Percent or Mean	Percent or Mean	
<b>Self-rated health</b>			
Excellent	1.08%	7.87%	<0.001
Very good	9.68%	31.31%	
Good	11.23%	34.60%	
Fair	53.24%	19.99%	
Poor	24.78%	6.23%	
<b>Age</b>	71.69 ± 0.12	74.06 ± 0.09	<0.001
<b>Gender</b>			
Male	52.87%	43.45%	<0.001
Female	47.13%	56.55%	
<b>Marital status</b>			
Married/Partnered	73.72%	59.79%	<0.001
Separated/Divorced/Widowed/Never married	26.28 %	40.21%	
<b>Number of living children</b>	3.54 ± 0.03	3.03 ± 0.02	<0.001
<b>Living arrangements</b>			
Living with spouse/partner	73.26%	58.77%	<0.001
Living alone	9.80%	29.87%	
Living with others without spouse or partner	16.95%	11.37%	
<b>Currently working <sup>a</sup></b>	45.00%	22.79%	<0.001
<b>Educational level <sup>b</sup></b>			
Less than lower secondary	90.87%	19.44%	<0.001
Upper secondary & vocational training	6.84%	30.77%	
Tertiary	2.29%	49.79%	



<b>ADLs</b>				
	0	85.29%	86.45%	<b>0.037</b>
	1	8.93%	8.61%	
	2	3.76%	3.74%	
	3	2.02%	1.20%	
<b>IADLs</b>				
	No difficulty	74.94%	91.30%	<b>&lt;0.001</b>
	With difficulty	25.06%	8.70%	
<b>Self-reported memory</b>				
	Excellent	0.68%	3.05%	<b>&lt;0.001</b>
	Very good	3.82%	21.00%	
	Good	7.36%	44.68%	
	Fair	50.20%	26.24%	
	Poor	37.94%	5.03%	
	<b>Recall summary score</b>	5.19 ± 0.07	9.47 ± 0.05	<b>&lt;0.001</b>
<b>Number of mental health problems</b>				
	0	32.58%	51.47%	<b>&lt;0.001</b>
	1	26.23%	22.30%	
	2	15.09%	10.67%	
	3	9.95%	6.83%	
	4	7.76%	4.04%	
	5	5.51%	3.05%	
	6	2.89%	1.64%	
	<b>High blood pressure</b>	46.27%	68.28%	<b>&lt;0.001</b>
	<b>Diabetes</b>	13.70%	26.70%	<b>&lt;0.001</b>
	<b>Cancer</b>	1.78%	20.97%	<b>&lt;0.001</b>
	<b>Lung disease</b>	21.44%	12.06%	<b>&lt;0.001</b>
	<b>Heart problem</b>	25.64%	32.46%	<b>&lt;0.001</b>
	<b>Stroke</b>	5.84%	10.41%	<b>&lt;0.001</b>
	<b>Psychiatric problems</b>	2.51%	19.09%	<b>&lt;0.001</b>
	<b>Arthritis</b>	51.03%	69.83%	<b>&lt;0.001</b>

<b>Ever drinking<sup>c</sup></b>	46.98%	53.52%	<b>&lt;0.001</b>
<b>Ever smoking</b>	48.88%	55.95%	<b>&lt;0.001</b>

Notes:

a. The question about currently working in the US survey asked the respondents “are you doing any work for pay at the present time”. In contrast, the question in the Chinese survey indicated not only the paid work but also the unpaid family business and the time span is specific to the last year, rather than the present time.

b. Regarding educational level, the three categories in the US were: less than high school, high-school graduate, and some college or college and above.

c. Regarding drinking, unlike the US, China asked the respondent's drinking behavior in a longer time period (1 year). Also, China had a different list of alcoholic drink for a respondent to select due to the fact that some types of alcoholic drinks were common in China but not in the other country. For example, white liquor and liang of liquor.

Table 2 Results of ordered logistic regression

Self-rated health	China				US				Overall			
	OR	P	95% CI		OR	P	95% CI		OR	P	95% CI	
<b>US vs. China</b>	-	-	-	-	-	-	-	-	4.88	<0.001	4.06	5.86
<b>Age</b>	1.00	0.753	0.99	1.02	1.02	<0.001	1.01	1.03	1.01	0.140	1.00	1.02
<b>Female</b>	1.13	0.268	0.91	1.41	1.06	0.321	0.95	1.17	1.13	0.051	1.00	1.27
<b>Living arrangements</b>												
Living alone	1.25	<b>0.043</b>	1.01	1.56	0.96	0.528	0.86	1.08	1.10	0.125	0.97	1.24
Living with others without spouse or partner	1.06	0.605	0.85	1.31	0.85	<b>0.049</b>	0.73	1.00	1.01	0.931	0.85	1.19
<b>Number of living children</b>	1.00	0.840	0.96	1.05	1.02	0.166	0.99	1.04	1.01	0.355	0.99	1.04
<b>Currently working</b>	1.11	0.180	0.95	1.29	1.31	<0.001	1.16	1.48	1.15	<b>0.016</b>	1.03	1.29
<b>Educational level</b>												
Upper secondary & vocational training	1.26	0.302	0.81	1.94	1.23	<b>0.005</b>	1.07	1.41	1.20	0.125	0.95	1.52
Tertiary	0.94	0.787	0.62	1.43	1.48	<0.001	1.28	1.71	1.40	<0.001	1.17	1.68
<b>ADLs</b>												
1	0.52	<0.001	0.40	0.67	0.48	<0.001	0.40	0.57	0.51	<0.001	0.43	0.62
2	0.35	<0.001	0.24	0.51	0.25	<0.001	0.18	0.33	0.31	<0.001	0.23	0.41
3	0.31	<b>0.001</b>	0.16	0.62	0.23	<0.001	0.14	0.40	0.29	<0.001	0.17	0.50
<b>IADLs</b>	0.91	0.288	0.76	1.08	0.90	0.302	0.74	1.10	0.91	0.233	0.78	1.06
<b>Self-reported memory</b>												
Very good	0.47	0.159	0.17	1.34	1.06	0.792	0.69	1.61	0.78	0.313	0.48	1.27
Good	0.22	<b>0.004</b>	0.08	0.61	0.57	<b>0.008</b>	0.38	0.86	0.40	<0.001	0.24	0.64

Fair	0.09	<0.001	0.03	0.24	0.31	<0.001	0.20	0.47	0.18	<0.001	0.11	0.29
Poor	0.05	<0.001	0.02	0.15	0.20	<0.001	0.12	0.32	0.11	<0.001	0.06	0.18
<b>Recall summary score</b>	0.98	0.124	0.96	1.00	1.02	<b>0.006</b>	1.01	1.04	0.99	0.467	0.98	1.01
<b>Number of mental health problems</b>												
1	0.75	<b>0.002</b>	0.62	0.90	0.60	<0.001	0.53	0.67	0.70	<0.001	0.61	0.79
2	0.46	<0.001	0.37	0.57	0.39	<0.001	0.33	0.46	0.44	<0.001	0.38	0.52
3	0.38	<0.001	0.30	0.49	0.26	<0.001	0.21	0.32	0.35	<0.001	0.29	0.43
4	0.27	<0.001	0.20	0.35	0.20	<0.001	0.15	0.26	0.26	<0.001	0.21	0.32
5	0.24	<0.001	0.17	0.33	0.19	<0.001	0.14	0.27	0.23	<0.001	0.17	0.30
6	0.15	<0.001	0.10	0.24	0.29	<0.001	0.18	0.45	0.18	<0.001	0.12	0.25
<b>High blood pressure</b>	0.75	<0.001	0.64	0.86	0.67	<0.001	0.60	0.75	0.73	<0.001	0.65	0.81
<b>Diabetes</b>	0.84	0.110	0.67	1.04	0.61	<0.001	0.55	0.68	0.72	<0.001	0.63	0.82
<b>Cancer</b>	0.43	<b>0.004</b>	0.25	0.76	0.59	<0.001	0.53	0.67	0.60	<0.001	0.52	0.68
<b>Lung disease</b>	0.64	<0.001	0.52	0.78	0.52	<0.001	0.44	0.60	0.61	<0.001	0.52	0.72
<b>Heart problem</b>	0.65	<0.001	0.54	0.79	0.57	<0.001	0.52	0.63	0.64	<0.001	0.57	0.72
<b>Stroke</b>	0.54	<0.001	0.38	0.75	0.72	<0.001	0.62	0.85	0.62	<0.001	0.51	0.75
<b>Psychiatric problems</b>	0.61	<b>0.032</b>	0.39	0.96	0.86	<b>0.040</b>	0.75	0.99	0.77	<b>0.001</b>	0.67	0.89
<b>Arthritis</b>	0.73	<0.001	0.63	0.84	0.64	<0.001	0.57	0.71	0.70	<0.001	0.63	0.78
<b>Ever drinking</b>	0.97	0.736	0.82	1.15	1.41	<0.001	1.28	1.57	1.11	0.087	0.99	1.24
<b>Ever smoking</b>	1.04	0.686	0.85	1.27	0.93	0.150	0.84	1.03	0.98	0.691	0.87	1.09

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**Contribution statement:**

D. Xu and G. Arling conceived the study and wrote the first draft of the manuscript. K. Wang contributed to the study design and helped draft the manuscript. All authors participated in the writing of subsequent versions and approved the final article.

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**Data sharing statement:**

This is a secondary analysis of existing public data sets (Health and Retirement Study (HRS) and China Health and Retirement Longitudinal Study (CHARLS)). This analysis used data or information from the harmonized dataset and codebook developed by the Gateway to Global Aging Data. For more information, please refer to [www.g2aging.org](http://www.g2aging.org). Analyses and Stata code not included in the present article are available upon request to the corresponding author.

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**Patient consent:** Not required

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# BMJ Open

## A Cross-sectional Study of Self-Rated Health among Older Adults: A Comparison of China and the United States

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3 **A Cross-sectional Study of Self-Rated Health among Older Adults: A Comparison of China**  
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6 **and the United States**  
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## ABSTRACT

**Objectives:** We used nationally representative samples of China and the US older population to investigate: 1) whether factors influencing self-rated health among older Chinese were similar to those among older Americans; and 2) whether there was a significant cross-national difference in self-rated health between China and the US after controlling those available influencing factors.

**Design:** A cross-sectional study. Data came from the 2014 Health and Retirement Study (HRS) and China Health and Retirement Longitudinal Study (CHARLS) conducted from 2014 through 2015.

**Participants:** Our final sample size totaled 8,905 older adults in the US and 4,442 older adults in China.

**Outcome:** The response variable was self-rated health. Ordered logistic regression models were conducted to investigate factors influencing self-rated health among older adults.

**Results:** More than three fourths (78%) of older adults in China reported fair or poor health status, while almost 74% of older adults in the US reported excellent, very good or good health status. In the overall ordered logistic regression model, when controlling statistically for sociodemographics, family structure, functional limitations, cognition, chronic conditions, mental health, and health-related behaviors, the Chinese survey respondents were much more likely to rate their health as being poorer than the US respondents. The odds of having better versus poorer health was almost 5 times greater in American older adults than those in China (OR=4.88, 95% CI: 4.06-5.86). Older adults in China living alone rated their health better than those living with spouse/partner; however, no significant difference was found between these two living arrangements in older Americans. In contrast, older adults in the US living with others

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3 rated their health worse compared to those living with spouse/partner. In addition, older adults  
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5 who had more ADLs limitations, poorer self-reported memory, worse mental health, and chronic  
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7 health conditions, had lower self-rated health in both countries.  
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11 **Conclusions:** We found a striking difference in self-rated health between China and the US even  
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13 after controlling for measures of disease, functional status, and other influencing factors.  
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15 Relative to their American counterparts, Chinese elders were much more likely to report worse  
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17 health.  
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23 **Keywords:** self-rated health, older adults, China, the United States, living arrangement  
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### Strengths and limitations of this study

- We used nationally representative samples of China and the US older population to investigate self-rated health.
- With the global aging of the population, this study of cross-national comparison provides a unique perspective to gain knowledge on the similarities and differences in older adults' self-rated health.
- Some variables such as drinking behavior, currently working, and education level were not exactly the same questions surveyed in China and the US, although they were defined as closely as possible in our harmonized datasets.
- More information on health literacy, access to health services would be beneficial for further examining the differences in self-rated health among older adults between the US and China.

## INTRODUCTION

Self-rated health measures the subjective perception of an individual's overall health status and is an important and robust predictor of health outcomes among older adults, such as disability, morbidity, and mortality.<sup>1-4</sup> Predictors of self-rated health include demographic, cognitive, physical, social, and mental factors.<sup>4-7</sup>

Although previous research has demonstrated many factors influencing self-rated health in the older population, most studies were conducted in one country and only a few did cross-national comparisons. For example, Hardy et al (2014) investigated self-rated health among 11 European countries using data from the Survey of Health, Ageing and Retirement in Europe (SHARE).<sup>8</sup> To our best knowledge, no study has compared older adults' self-rated health between the US and China. With the global aging of the population, cross-national comparison provides a unique perspective to gain knowledge on the similarities and differences in the aging experience. China and the US present interesting comparative examples to policymakers and researchers to identify factors influencing older adults' self-rated health. These two countries have shown similar trends in aging and health. More people are living longer with multiple chronic conditions, and cardiovascular disease, lung disease, cancer, and stroke have become the leading causes of death.<sup>9</sup> Meanwhile, China and the US may have different patterns in demographics and health risk factors. For example, in 2015, the 80-and-older population in the US represented 25.3 percent of its older population, while the share was 18.2 percent in China.<sup>9</sup> The prevalence of hypertension is higher in the US (46.9% vs. 38.6%) among adults aged 45 to 75 years old during 2011-2012.<sup>10</sup> Moreover, the family and sociocultural environments may play different roles in health and aging in these two countries. For example, filial piety, which is a virtue of obedience, respect, and care for one's parents and elders, is an essential value in Chinese culture.<sup>11</sup> The

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3 traditional concept of “raising children for the purpose of being cared in old age” is still  
4 prevalent.<sup>12</sup> Social life is mainly family oriented and older adults give high priority to close kin  
5 relations and familial interests.<sup>13, 14</sup> Unlike in China, individuality and independence are highly  
6 valued in the US and children are encouraged to be independent and leave home as soon as  
7 possible.<sup>15</sup> Another important difference between Chinese and American is the way they view  
8 humility. Humility is a revered virtue in China<sup>11, 16</sup> while in the US humility may be considered  
9 as a sign of weakness.<sup>15</sup> A recent study indicated there was a negative association between  
10 humility and better self-rated health.<sup>17</sup> Older adults’ perception of health is contingent on their  
11 sociocultural context in which they are embedded.<sup>3</sup> Therefore, it is particularly important to  
12 understand how factors including demographics, health patterns, family and sociocultural  
13 environments influence self-rated health among older adults in China and the US.  
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29 We used nationally representative samples of China and the US older population to investigate:

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31 1) whether factors influencing self-rated health among older Chinese were similar to those  
32 among older Americans, and 2) whether there was a significant cross-national difference in self-  
33 rated health between China and the US after controlling for potential covariates (or confounders).  
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## 39 **METHODS**

### 40 41 **Data and Samples**

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43 Data for this study came from the 2014 Health and Retirement Study (HRS) and China Health  
44 and Retirement Longitudinal Study (CHARLS) conducted from 2014 through 2015. The HRS is  
45 a longitudinal study of individuals over age 50 in the US, which collects information about  
46 demographics, cognition, health, family structure, health care utilization, and insurance. The  
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60 CHARLS is a national longitudinal study of Chinese aged 45 years and older, which is designed

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3 to be comparable with the HRS in the US. This study uses information from the RAND HRS and  
4 the Harmonized CHARLS datasets. The Harmonized CHARLS dataset, created by the Gateway  
5 to Global Aging Data, consists of variables defined as closely as possible to the RAND HRS.  
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10 Initially, 10,374 older adults in the US and 5,751 older adults in China reported their health  
11 status. Number and percentage of missing data is presented in Appendix Table A. We used list-  
12 wise deletion for handling missing data. Our samples include respondents aged 65 years and  
13 older at the time of the surveys who provided full information on all analysis variables. Our final  
14 sample size totaled 8,905 older adults in the US and 4,442 older adults in China.  
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## 23 **Measures**

### 24 *Self-rated health*

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26 Respondents were asked to self-report their current general health status using a scale ranging  
27 from 1 for poor to 5 for excellent.  
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### 29 *Sociodemographic and family structure variables*

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31 Sociodemographic variables consisted of age, sex, educational level, and employment (currently  
32 working). Family structure variables included living arrangement and number of children.  
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35 Regarding educational level, the three categories in the US were: less than high school, high-  
36 school graduate, and some college or college and above; the three categories in China were: less  
37 than lower secondary, upper secondary and vocational training, and tertiary education. The  
38 question about currently working in the US survey asked the respondents “are you doing any  
39 work for pay at the present time”. In contrast, the question in the Chinese survey indicated not  
40 only the paid work but also the unpaid family business and the time span is specific to the last  
41 year, rather than the present time. Living arrangements were defined into three groups: living  
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3 alone, living with spouse or partner (regardless of whether they also lived with others), and  
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5 living with others without spouse or partner.  
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### 8 *Functional limitations*

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11 An activities of daily living (ADLs) summary score was derived from respondent's report of any  
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13 difficulty in bathing, dressing, and eating. The summary score ranged from 0 to 3, with higher  
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15 scores indicating more functional limitations. An instrumental activities of daily living (IADLs)  
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17 binary variable indicated whether respondents reported difficulty in using the phone, managing  
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19 money, or taking medications.  
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### 22 *Cognition*

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25 Self-reported memory was evaluated using a scale ranging from 1 for excellent to 5 for poor. A  
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27 total recall summary score counted the number of words respondents could recall correctly from  
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29 a list of 10 different words both immediately and later in the survey. The score ranged from 0 to  
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31 20 with higher scores indicating better word recall.  
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### 34 *Chronic conditions*

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37 Respondents reported whether or not having been told by a doctor he/she had a specific  
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39 condition. There were 8 chronic conditions including high blood pressure, diabetes, cancer, lung  
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41 disease, heart problem, stroke, psychiatric problems, and arthritis.  
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### 45 *Mental health*

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48 Mental health score was a sum of 6 questions related to respondent's feeling during the past  
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50 week: felt depressed, felt everything was an effort, sleep was restless, felt happy, felt lonely, and  
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52 felt he or she could not get going. After reverse coding whether the respondent felt happy, the  
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3 sum score ranged from 0 to 6 with higher scores indicating that the respondent felt more negative  
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5 feelings.  
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### 8 *Health-related behaviors*

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11 Health-related behavioral questions included if he/she drank and smoked in the past. Unlike the  
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13 HRS, the CHARLS asked drinking behavior in a longer time period (1 year).  
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### 16 **Statistical Analysis**

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19 A set of chi-square or t-tests were used to evaluate the statistical significance of differences  
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21 between the US and China. Ordered logistic regression models were conducted to investigate  
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23 factors influencing self-rated health among older adults in the US and China respectively. In the  
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25 full ordered logistic regression model, a country variable (the US vs. China) was added to further  
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27 investigate whether there was a significant difference in self-rated health between US and China  
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29 after controlling sociodemographics (age, sex, educational level, currently working), family  
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31 structure (living arrangements, number of children), functional limitations (ADLs and IADLs),  
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33 cognition (self-reported memory, a total recall summary score), chronic conditions (high blood  
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35 pressure, diabetes, cancer, lung disease, heart problem, stroke, psychiatric problems, and  
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37 arthritis), mental health, and health-related behaviors (ever drinking and ever smoking).  
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44 We used ordered logistic regression analysis as our primary statistical approach. This approach  
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46 takes advantage of the full five-category of self-rated health in the analyses rather than collapsing  
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48 the categories into a binary indicator. Ordered logistic regression provides one set of coefficients  
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50 under the assumption that the association between an independent variable and each pair of  
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52 outcome groups is the same (this is called the proportional odds assumption). Our test of  
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54 proportional odds assumption found that some independent variables, including country (the US  
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3 vs. China), educational level, hypertension, diabetes, stroke, and arthritis, did not meet the  
4 proportional odds assumption. In order to test the sensitivity of the results for variables violating  
5 the proportional odds assumption, we ran additional regression models (reported in Appendix  
6 Table B) with four different ways to bifurcate the scale of self-rated health.  
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12 In additional sensitivity analyses, we categorized age (65-74, 75-84, and 85+) and number of  
13 children (0, 1, 2, and 3+ children). We also included a square term of age in the models to check  
14 whether there were curvilinear trends. Because of the non-significant results, we dropped the  
15 square term of age from the models. The variance inflation factor (VIF) values of all variables in  
16 the model were less than 10. Therefore, multicollinearity was not an issue in the analyses. As a  
17 final sensitivity test, we repeated the analyses using the earlier 2012-2013 HRS and CHARLS  
18 data sets to check robustness of national difference in self-rated health between the US and  
19 China. All estimates were population weighted and standard errors adjusted for complex survey  
20 design. All statistical analyses were performed using Stata 14.1. Statistical significance was  
21 established at the 95% level ( $p < 0.05$ ).  
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### 36 37 **Patient and Public Involvement**

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40 This study did not involve patients and the public. Because the study was based on publically  
41 available, de-identified data, it was exempt from Institutional Review Board review.  
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### 46 47 **RESULTS**

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49 Population-weighted characteristics of older adults in the US and China are presented in Table 1.  
50 Compared to the US population, older adults in China were younger by 2.4 years on average, had  
51 higher proportions of male, married/partnered, less educated, and currently working. More than  
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3 73% of older Chinese lived with a spouse or partner, 10% lived alone, and 17% lived with others  
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5 without a spouse or partner; while 59% of older Americans lived with a spouse or partner, 30%  
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7 lived alone, and 11% lived with others without a spouse or partner. Older adults in China had a  
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9 higher average number of living children than those in the US. Older Chinese reported having  
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11 more IADLs limitations relative to older Americans; however, the difference in ADLs  
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13 limitations was small. Older Chinese reported a lower proportion of chronic conditions ever told  
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15 by a doctor including high blood pressure, diabetes, cancer, heart problem, stroke, psychiatric  
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17 problems, and arthritis, and a higher proportion of lung disease than older Americans. Older  
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19 Chinese had worse mental health and worse cognition including self-reported memory and total  
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21 recall summary score, compared to older Americans.  
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27 Regarding factors influencing self-rated health among older adults, we found similar results in  
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29 China and the US (Table 2). As expected, older adults who had more ADLs limitations, poorer  
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31 self-reported memory, worse mental health, and chronic health conditions, had lower self-rated  
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33 health. Factors including sex, number of living children, IADLs limitations, and ever smoking  
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35 were not associated with self-rated health in these two countries. In sensitivity analysis, we  
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37 categorized number of children (0, 1, 2, and 3+ children) and found no significant associations  
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39 between number of children and self-rated health.  
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44 On the other hand, some factors had different associations with self-rated health between China  
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46 and the US (Table 2). Older adults in China living alone rated their health better than those living  
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48 with spouse/partner (OR=1.25, P=0.043); however, no significant difference was found between  
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50 these two living arrangements in older Americans (OR=0.96, P=0.528). In contrast, older adults  
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52 in the US living with others rated their health worse compared to those living with  
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54 spouse/partner (OR=0.85, P=0.049). In addition, age, currently working, educational level, recall  
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3 summary score, and ever drinking had positive associations with self-rated health in older  
4 Americans, however, no significant associations were found in older Chinese. In sensitivity  
5 analyses, we categorized age (65-74, 75-84, and 85+) and found that age groups were not  
6 association with self-rated health in China, while in the US, compared to those aged 65-74, older  
7 adults aged 75-84 and aged 85+ reported better health respectively.  
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12 More than three fourths (78%) of older adults in China reported fair or poor health status, while  
13 almost 74% of older adults in the US reported excellent, very good or good health status (Table  
14 1). In the overall ordered logistic regression model (Table 2), when controlling statistically for  
15 sociodemographics, family structure, functional limitations, cognition, chronic conditions,  
16 mental health, and health-related behaviors, the Chinese survey respondents were much more  
17 likely to rate their health as being poorer than the US respondents. The odds of having better  
18 versus poorer health was almost 5 times greater in American older adults than those in China  
19 (OR=4.88, 95% CI: 4.06-5.86, Table 2). Because of the issue with the proportional odds  
20 assumption, we performed sensitivity analysis with alternative models. When shifting  
21 comparison pivot point down the self-rated health scale, we found the odds ratios range from  
22 3.98 to 7.92 in the logistic regression models (Table 3). For example, the odds of having the  
23 combined “good”, “very good”, or “excellent” health versus “fair” or “poor” health was 7 times  
24 greater in American older adults than those in China (OR=7.03, 95% CI: 5.41-9.12, Table 3). We  
25 also tested the sensitivity of our ordered logistic regression model using the 2012-2013 HRS and  
26 CHARLS data sets and found a significant national difference of self-rated health between the  
27 US and China (OR=5.86, 95% CI: 4.88-7.03, data not shown).  
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## 52 **DISCUSSION**

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3 Using the nationally representative samples of the older population, the study found both cross-  
4 national similarities and differences between China and the US. Many factors including sex,  
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6 national similarities and differences between China and the US. Many factors including sex,  
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8 ADLs, IADLs, self-reported memory, chronic conditions (high blood pressure, cancer, lung  
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10 disease, heart problem, stroke, psychiatric problems, and arthritis), mental health, ever smoking  
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12 and number of living children had consistent and similar associations with self-rated health in  
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14 both China and the US.  
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18 On the other hand, family living arrangements appeared to play different roles in self-rated  
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20 health among older people in these two countries. Independence and privacy is highly valued in  
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22 American family and they often have access to formal supports in the community; while in  
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24 China living with adult children is more normative because they are expected to take care of their  
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26 elders, and elder parents are expected to provide grandchild care.<sup>18, 19</sup> This is supported by our  
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28 findings. A much higher proportion of American elders lived alone than their Chinese  
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30 counterparts (30% versus 10%), while a much higher proportion of Chinese elders lived with  
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32 others with no spouse or partner present than their American counterparts (17% versus 11%). In  
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34 the US, co-residence of older adults with others may indicate vulnerable health and need for live-  
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36 in assistance.<sup>20</sup> We found that American elders living with others with no spouse or partner  
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38 present reported worse health status than those in other living arrangements. However, living  
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40 with others did not signal a similar fragility of health in China. We found that Chinese elders  
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42 living with others without spouse or partner reported similar health status compared to those  
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44 living with spouse or partner, while Chinese elders living alone reported better health status. This  
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46 may be explained by the two situations for Chinese elders living with others without spouse or  
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48 partner. On the one hand, similar to the US elders, they were vulnerable and could not live alone.  
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50 Thus, they had to live with others to receive the assistance they needed. On the other hand, in  
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3 China elders who have better health status may be called upon to provide grandchild care. It is  
4 not uncommon in China for elders to separate from their spouse or partner and live with their  
5 adult children to take care of their grandchild. In addition, there were no statistically significant  
6 differences by number of children in both China and the US. Our study suggests that the quality  
7 of parent-child relationships may matter most, not the quantity of children. For example, a recent  
8 study found that anticipated support from children, the belief that children would provide support  
9 if needed, was associated with older parents' better self-rated health.<sup>21</sup> This may have important  
10 implications for China since the one-child policy has led to smaller family size and changes in  
11 family structure and relations.  
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24 We found a striking difference on self-rated health between China and the US even after  
25 adjusting all available influencing factors including sociodemographic, family structure,  
26 functional limitations, cognition, chronic conditions, mental health, and health-related behaviors.  
27 Relative to their American counterparts, Chinese elders were much more likely to report worse  
28 health. There are several possible explanations for this finding. First, Chinese elders may have  
29 under-reported their chronic conditions; the prevalence of chronic conditions reported in this  
30 Chinese older adult sample was relatively low compared with previous studies.<sup>22-24</sup> Chinese older  
31 adults, especially those in rural areas, had limited access to health services and could not be  
32 diagnosed by physicians.<sup>25</sup> Second, older adults in China may not have understood the  
33 implications of their health conditions. Chinese elders had a lower education level relative to  
34 those in the US. It is reasonable to suspect that the health literacy was correspondingly low. Due  
35 to low health literacy, Chinese elders may have limited capacity to obtain, process, and  
36 understand health information and services. As a result they may be less likely to receive  
37 treatments, have poor self-management of chronic conditions and experience more severe  
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3 symptoms.<sup>26</sup> For example, Lu et al. (2018) found that compared to the US, China had a higher  
4 proportion of patients with severe hypertension (10.5% vs. 4.5%) and lower rates of hypertension  
5 treatment (46.8% vs. 77.9%) and control (20.3% vs. 54.7%) among population aged 45-75 years  
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7 old, even though the prevalence of hypertension was lower in China.<sup>10</sup>  
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12 Another possible explanation is the sociocultural context for self-rated health. In China, it is a  
13 virtue to be humble and modest,<sup>11</sup> and older adults may tend to downplay their own health. In  
14 contrast, older adults in the US may be reluctant to see their health as poor for fear of losing their  
15 independence or being a burden on others. Moreover, older adults may perceive “fair” in the  
16 scale of self-rated health measure is the midpoint of the scale with the meaning of average health  
17 status in Chinese culture. Our findings have important implications for cross-national  
18 comparisons on self-rated health between the US and China, with the caution that older adults’  
19 social and cultural contexts may shape their perceptions of health.  
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32 There were limitations in this study. First, although the data from the HRS and CHARLS  
33 provided a unique opportunity to make country-by-country comparisons, it did not allow us to  
34 examine certain factors influencing older adults’ self-rated health in detail. More information on  
35 health literacy, access to health services would be beneficial for further examining the  
36 differences in self-rated health among older adults between the US and China. This provides  
37 impetus to further data collection efforts. Second, some variables such as drinking behavior,  
38 currently working, and education level were not exactly the same questions surveyed in China  
39 and the US, although they were defined as closely as possible in our harmonized datasets. This  
40 may have an effect on our results.  
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## 52 53 **CONCLUSION** 54 55 56 57 58 59 60

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3 Using the nationally representative samples of the older population, we found a striking  
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5 difference in self-rated health between China and the US even after controlling for measures of  
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7 disease, functional status, and other influencing factors. Relative to their American counterparts,  
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9 Chinese elders were much more likely to report worse health.  
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## TABLES

Table 1 Sample characteristics

	China (Sample N=4,442) (Population N=98,355,397)	US (Sample N=8,905) (Population N=40,690,149)	P value
	Percent or Mean	Percent or Mean	
<b>Self-rated health</b>			
Excellent	1.08%	7.87%	<0.001
Very good	9.68%	31.31%	
Good	11.23%	34.60%	
Fair	53.24%	19.99%	
Poor	24.78%	6.23%	
<b>Age</b>	71.69 ± 0.12	74.06 ± 0.09	<0.001
<b>Sex</b>			
Male	52.87%	43.45%	<0.001
Female	47.13%	56.55%	
<b>Marital status</b>			
Married/Partnered	73.72%	59.79%	<0.001
Separated/Divorced/Widowed/Never married	26.28 %	40.21%	
<b>Number of living children</b>	3.54 ± 0.03	3.03 ± 0.02	<0.001
<b>Living arrangements</b>			
Living with spouse/partner	73.26%	58.77%	<0.001
Living alone	9.80%	29.87%	
Living with others without spouse or partner	16.95%	11.37%	
<b>Currently working <sup>a</sup></b>	45.00%	22.79%	<0.001
<b>Educational level <sup>b</sup></b>			
Less than lower secondary	90.87%	19.44%	<0.001

Upper secondary & vocational training	6.84%	30.77%	
Tertiary	2.29%	49.79%	
<b>ADLs</b>			
0	85.29%	86.45%	<b>0.037</b>
1	8.93%	8.61%	
2	3.76%	3.74%	
3	2.02%	1.20%	
<b>IADLs</b>			
No difficulty	74.94%	91.30%	<b>&lt;0.001</b>
With difficulty	25.06%	8.70%	
<b>Self-reported memory</b>			
Excellent	0.68%	3.05%	<b>&lt;0.001</b>
Very good	3.82%	21.00%	
Good	7.36%	44.68%	
Fair	50.20%	26.24%	
Poor	37.94%	5.03%	
<b>Recall summary score</b>	<b>5.19 ± 0.07</b>	<b>9.47 ± 0.05</b>	<b>&lt;0.001</b>
<b>Number of mental health problems</b>			
0	32.58%	51.47%	<b>&lt;0.001</b>
1	26.23%	22.30%	
2	15.09%	10.67%	
3	9.95%	6.83%	
4	7.76%	4.04%	
5	5.51%	3.05%	
6	2.89%	1.64%	
<b>High blood pressure</b>	<b>46.27%</b>	<b>68.28%</b>	<b>&lt;0.001</b>
<b>Diabetes</b>	<b>13.70%</b>	<b>26.70%</b>	<b>&lt;0.001</b>
<b>Cancer</b>	<b>1.78%</b>	<b>20.97%</b>	<b>&lt;0.001</b>
<b>Lung disease</b>	<b>21.44%</b>	<b>12.06%</b>	<b>&lt;0.001</b>
<b>Heart problem</b>	<b>25.64%</b>	<b>32.46%</b>	<b>&lt;0.001</b>
<b>Stroke</b>	<b>5.84%</b>	<b>10.41%</b>	<b>&lt;0.001</b>

<b>Psychiatric problems</b>	2.51%	19.09%	<b>&lt;0.001</b>
<b>Arthritis</b>	51.03%	69.83%	<b>&lt;0.001</b>
<b>Ever drinking<sup>c</sup></b>	46.98%	53.52%	<b>&lt;0.001</b>
<b>Ever smoking</b>	48.88%	55.95%	<b>&lt;0.001</b>

## Notes:

a. The question about currently working in the US survey asked the respondents “are you doing any work for pay at the present time”. In contrast, the question in the Chinese survey indicated not only the paid work but also the unpaid family business and the time span is specific to the last year, rather than the present time.

b. Regarding educational level, the three categories in the US were: less than high school, high-school graduate, and some college or college and above.

c. Regarding drinking, unlike the US, China asked the respondent's drinking behavior in a longer time period (1 year). Also, China had a different list of alcoholic drink for a respondent to select due to the fact that some types of alcoholic drinks were common in China but not in the other country. For example, white liquor and liang of liquor.

Table 2 Results of ordered logistic regression

Self-rated health	China				US				Overall			
	OR	P	95% CI		OR	P	95% CI		OR	P	95% CI	
<b>US vs. China</b>	-	-	-	-	-	-	-	-	4.88	<0.001	4.06	5.86
<b>Age</b>	1.00	0.753	0.99	1.02	1.02	<0.001	1.01	1.03	1.01	0.140	1.00	1.02
<b>Female</b>	1.13	0.268	0.91	1.41	1.06	0.321	0.95	1.17	1.13	0.051	1.00	1.27
<b>Living arrangements</b>												
Living alone	1.25	<b>0.043</b>	1.01	1.56	0.96	0.528	0.86	1.08	1.10	0.125	0.97	1.24
Living with others without spouse or partner	1.06	0.605	0.85	1.31	0.85	<b>0.049</b>	0.73	1.00	1.01	0.931	0.85	1.19
<b>Number of living children</b>	1.00	0.840	0.96	1.05	1.02	0.166	0.99	1.04	1.01	0.355	0.99	1.04
<b>Currently working</b>	1.11	0.180	0.95	1.29	1.31	<0.001	1.16	1.48	1.15	<b>0.016</b>	1.03	1.29
<b>Educational level</b>												
Upper secondary & vocational training	1.26	0.302	0.81	1.94	1.23	<b>0.005</b>	1.07	1.41	1.20	0.125	0.95	1.52
Tertiary	0.94	0.787	0.62	1.43	1.48	<0.001	1.28	1.71	1.40	<0.001	1.17	1.68
<b>ADLs</b>												
1	0.52	<0.001	0.40	0.67	0.48	<0.001	0.40	0.57	0.51	<0.001	0.43	0.62
2	0.35	<0.001	0.24	0.51	0.25	<0.001	0.18	0.33	0.31	<0.001	0.23	0.41
3	0.31	<b>0.001</b>	0.16	0.62	0.23	<0.001	0.14	0.40	0.29	<0.001	0.17	0.50
<b>IADLs</b>	0.91	0.288	0.76	1.08	0.90	0.302	0.74	1.10	0.91	0.233	0.78	1.06
<b>Self-reported memory</b>												
Very good	0.47	0.159	0.17	1.34	1.06	0.792	0.69	1.61	0.78	0.313	0.48	1.27
Good	0.22	<b>0.004</b>	0.08	0.61	0.57	<b>0.008</b>	0.38	0.86	0.40	<0.001	0.24	0.64

Fair	0.09	<0.001	0.03	0.24	0.31	<0.001	0.20	0.47	0.18	<0.001	0.11	0.29
Poor	0.05	<0.001	0.02	0.15	0.20	<0.001	0.12	0.32	0.11	<0.001	0.06	0.18
<b>Recall summary score</b>	0.98	0.124	0.96	1.00	1.02	<b>0.006</b>	1.01	1.04	0.99	0.467	0.98	1.01
<b>Number of mental health problems</b>												
1	0.75	<b>0.002</b>	0.62	0.90	0.60	<0.001	0.53	0.67	0.70	<0.001	0.61	0.79
2	0.46	<0.001	0.37	0.57	0.39	<0.001	0.33	0.46	0.44	<0.001	0.38	0.52
3	0.38	<0.001	0.30	0.49	0.26	<0.001	0.21	0.32	0.35	<0.001	0.29	0.43
4	0.27	<0.001	0.20	0.35	0.20	<0.001	0.15	0.26	0.26	<0.001	0.21	0.32
5	0.24	<0.001	0.17	0.33	0.19	<0.001	0.14	0.27	0.23	<0.001	0.17	0.30
6	0.15	<0.001	0.10	0.24	0.29	<0.001	0.18	0.45	0.18	<0.001	0.12	0.25
<b>High blood pressure</b>	0.75	<0.001	0.64	0.86	0.67	<0.001	0.60	0.75	0.73	<0.001	0.65	0.81
<b>Diabetes</b>	0.84	0.110	0.67	1.04	0.61	<0.001	0.55	0.68	0.72	<0.001	0.63	0.82
<b>Cancer</b>	0.43	<b>0.004</b>	0.25	0.76	0.59	<0.001	0.53	0.67	0.60	<0.001	0.52	0.68
<b>Lung disease</b>	0.64	<0.001	0.52	0.78	0.52	<0.001	0.44	0.60	0.61	<0.001	0.52	0.72
<b>Heart problem</b>	0.65	<0.001	0.54	0.79	0.57	<0.001	0.52	0.63	0.64	<0.001	0.57	0.72
<b>Stroke</b>	0.54	<0.001	0.38	0.75	0.72	<0.001	0.62	0.85	0.62	<0.001	0.51	0.75
<b>Psychiatric problems</b>	0.61	<b>0.032</b>	0.39	0.96	0.86	<b>0.040</b>	0.75	0.99	0.77	<b>0.001</b>	0.67	0.89
<b>Arthritis</b>	0.73	<0.001	0.63	0.84	0.64	<0.001	0.57	0.71	0.70	<0.001	0.63	0.78
<b>Ever drinking</b>	0.97	0.736	0.82	1.15	1.41	<0.001	1.28	1.57	1.11	0.087	0.99	1.24
<b>Ever smoking</b>	1.04	0.686	0.85	1.27	0.93	0.150	0.84	1.03	0.98	0.691	0.87	1.09

Table 3 Differences in self-rated health between the US and China in logistic regression models

Outcome variable: self-rated health	US vs. China			
	OR	Lower	Upper	P
Model 1: “excellent” vs. “very good”, “good”, “fair” and “poor”	7.92	5.19	12.09	<0.001
Model 2: “excellent” and “very good” vs. “good”, “fair” and “poor”	3.98	3.18	4.98	<0.001
Model 3: “excellent”, “very good”, and “good” vs. “fair” and “poor”	7.03	5.41	9.12	<0.001
Model 4: “excellent”, “very good”, “good”, and “fair” vs. “poor”	4.24	3.14	5.73	<0.001

Note: OR=odds ratio

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**Contribution statement:**

D. Xu and G. Arling conceived the study and wrote the first draft of the manuscript. K. Wang contributed to the study design and helped draft the manuscript. All authors participated in the writing of subsequent versions and approved the final article.

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**Funding:** None

**Data sharing statement:**

This is a secondary analysis of existing public data sets: Health and Retirement Study (HRS) and China Health and Retirement Longitudinal Study (CHARLS). This analysis used data or information from the harmonized dataset and codebook developed by the Gateway to Global Aging Data. For more information, please refer to [www.g2aging.org](http://www.g2aging.org). Analyses and Stata code not included in the present article are available upon request to the corresponding author.

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## Appendix

Table A. Missing data for each variable

Variables	China			US		
	Total number	Number of missing	Percent	Total number	Number of missing	Percent
Self-rated health	5751	0	0.00	10374	0	0.00
Age	5730	21	0.37	10374	0	0.00
Sex	5751	0	0.00	10374	0	0.00
Marital status	5751	0	0.00	10374	0	0.00
Number of living children	5751	0	0.00	10167	207	2.00
Living arrangements	5751	0	0.00	10374	0	0.00
Currently working	5623	128	2.23	10352	22	0.21
Educational level	5746	5	0.09	10370	4	0.04
ADLs	5741	10	0.17	10364	10	0.10
IADLs	5743	8	0.14	10364	10	0.10
Self-reported memory	5699	52	0.90	9565	809	7.80
Recall summary score	5451	300	5.22	9565	809	7.80
Number of mental health problems	5302	449	7.81	9450	924	8.91
High blood pressure	5361	390	6.78	10347	27	0.26
Diabetes	5325	426	7.41	10348	26	0.25
Cancer	5361	390	6.78	10338	36	0.35
Lung disease	5371	380	6.61	10353	21	0.20
Heart problem	5348	403	7.01	10345	29	0.28
Stroke	5370	381	6.62	10352	22	0.21
Psychiatric problems	5352	399	6.94	10350	24	0.23
Arthritis	5364	387	6.73	10351	23	0.22
Ever drinking	5740	11	0.19	10371	3	0.03
Ever smoking	5746	5	0.09	10288	86	0.83

Notes: ADLs: activities of daily living; IADLs: instrumental activities of daily living

Table B. Results of logistic regression models for variables violating proportional odds assumption in the US and China respectively

	<b>Model 1</b>	<b>Model 2</b>	<b>Model 3</b>	<b>Model 4</b>
	<b>OR</b>	<b>OR</b>	<b>OR</b>	<b>OR</b>
	<b>(95% CI)</b>	<b>(95% CI)</b>	<b>(95% CI)</b>	<b>(95% CI)</b>
<b>US</b>				
Education				
High-school	0.86 (0.61, 1.20)	1.01 (0.85, 1.21)	1.50 (1.26, 1.79)	1.13 (0.84, 1.50)
Some college or college and above	1.01 (0.73, 1.40)	1.28 (1.07, 1.53)	1.87 (1.56, 2.25)	1.12 (0.82, 1.52)
Hypertension	0.51 (0.41, 0.63)	0.65 (0.57, 0.74)	0.77 (0.66, 0.91)	0.85 (0.64, 1.13)
Diabetes	0.57 (0.41, 0.79)	0.52 (0.45, 0.60)	0.65 (0.56, 0.76)	0.79 (0.61, 1.01)
Stroke	0.60 (0.39, 0.92)	0.73 (0.59, 0.91)	0.81 (0.67, 0.99)	0.53 (0.40, 0.72)
Arthritis	0.50 (0.41, 0.62)	0.62 (0.54, 0.70)	0.74 (0.63, 0.87)	0.71 (0.51, 1.00)
<b>China</b>				
Education				
Upper secondary & vocational training	0.65 (0.14, 2.88)	0.75 (0.46, 1.24)	1.33 (0.68, 2.60)	1.62 (0.99, 2.64)
Tertiary		0.42 (0.17, 1.05)	1.19 (0.66, 2.13)	0.97 (0.52, 1.78)
Hypertension	0.76 (0.40, 1.48)	0.72 (0.56, 0.91)	0.74 (0.60, 0.91)	0.75 (0.63, 0.90)
Diabetes	1.32 (0.50, 3.48)	0.76 (0.47, 1.22)	0.67 (0.46, 0.98)	0.96 (0.74, 1.25)
Stroke	1.10 (0.20, 6.09)	0.70 (0.33, 1.48)	0.53 (0.31, 0.90)	0.51 (0.35, 0.75)
Arthritis	0.55 (0.30, 1.04)	0.49 (0.38, 0.63)	0.62 (0.50, 0.77)	0.84 (0.70, 1.01)

Notes:

1. Outcome variable in logistic regression models:

- Model 1: self-rated health (“excellent” vs. “very good”, “good”, “fair” and “poor”)
- Model 2: self-rated health (“excellent” and “very good” vs. “good”, “fair” and “poor”)
- Model 3: self-rated health (“excellent”, “very good”, and “good” vs. “fair” and “poor”)
- Model 4: self-rated health (“excellent”, “very good”, “good”, and “fair” vs. “poor”)

2. Because only 3 older adults with tertiary education level reported excellent health, the odds ratio was not estimated.

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3 3. All models included sociodemographics (age, sex, educational level, currently working),  
4 family structure (living arrangements, number of children), functional limitations (ADLs and  
5 IADLs), cognition (self-reported memory, a total recall summary score), chronic conditions  
6 (high blood pressure, diabetes, cancer, lung disease, heart problem, stroke, psychiatric problems,  
7 and arthritis), mental health, and health-related behaviors (ever drinking and ever smoking).  
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60STROBE Statement—Checklist of items that should be included in reports of *cross-sectional studies*

	Item No	Recommendation	Page(s)
Title and abstract	1	(a) Indicate the study's design with a commonly used term in the title or the abstract	1
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	2-3
<b>Introduction</b>			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	5-6
Objectives	3	State specific objectives, including any prespecified hypotheses	6
<b>Methods</b>			
Study design	4	Present key elements of study design early in the paper	6-7
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	6-7
Participants	6	(a) Give the eligibility criteria, and the sources and methods of selection of participants	7
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	7-9
Data sources/measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	6-7
Bias	9	Describe any efforts to address potential sources of bias	7
Study size	10	Explain how the study size was arrived at	7
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	9-10
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding	9-10
		(b) Describe any methods used to examine subgroups and interactions	9-10
		(c) Explain how missing data were addressed	7
		(d) If applicable, describe analytical methods taking account of sampling strategy	10
		(e) Describe any sensitivity analyses	10
<b>Results</b>			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	NA
		(b) Give reasons for non-participation at each stage	NA
		(c) Consider use of a flow diagram	NA
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic,	10-11 &

		clinical, social) and information on exposures and potential confounders	Table 1
		(b) Indicate number of participants with missing data for each variable of interest	Appendix A
Outcome data	15*	Report numbers of outcome events or summary measures	
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	11-12 & Table 2 & Table 3
		(b) Report category boundaries when continuous variables were categorized	7-8
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	Cross-sectional study; Not appropriate to translate
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	10-12 & Appendix B
<b>Discussion</b>			
Key results	18	Summarise key results with reference to study objectives	12-15
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	15
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	12-15
Generalisability	21	Discuss the generalisability (external validity) of the study results	15
<b>Other information</b>			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	24

\*Give information separately for exposed and unexposed groups.

**Note:** An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at [www.strobe-statement.org](http://www.strobe-statement.org).