

Socioeconomic status, social capital, health risk behaviors, and health-related quality of life among Chinese older adults

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Research

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Abstract

Background: The present study described the occurrence of health risk behaviors among Chinese older adults, and developed a structural equation model (SEM) to assess the associations between socioeconomic status (SES), social capital, health risk behaviors, and health-related quality of life (HRQoL).

Methods: We conducted this cross-sectional study in Hubei, Jiangxi, Guangdong, and Fujian provinces, etc., China between January and March 2018. Demographic characteristics (age, gender, marital status, place of residence), SES (education level, family income), and health risk behaviors (smoking, alcohol consumption, physical inactivity, unhealthy diet, overweight or obesity, and sleep insufficient or excessive) were investigated. Social capital and HRQoL were assessed by the 16-item Personal Social Capital Scale (PSCS-16) and WHOQOL-Old, respectively. Structural equation modeling was applied to assess the associations between variables.

Results: A total of 5439 older adults were included in this study. The prevalence of smoking, alcohol consumption, physical inactivity, unhealthy diet, overweight or obesity, and sleep insufficient or excessive were 34.7%, 34.4%, 64.3%, 45.0%, 26.6%, and 40.1%, respectively. 75% of the participants reported ≥ 2 health risk behaviors. Elderly individuals with more co-occurrence number of health risk behaviors demonstrated significant poor HRQoL ($F = 52.99$, $p < 0.01$). Smoking, physical inactivity, and unhealthy diet exhibited significant negative associations with HRQoL. Social capital, SES, as well as overweight or obesity, and sleep insufficient or excessive showed positive associations with HRQoL. Higher level of social capital positively associated with the occurrence of alcohol consumption, sleep insufficient or excessive, and negatively associated with physical inactivity, unhealthy diet, and overweight or obesity.

Conclusions: Chinese older adults demonstrated high prevalence of health risk behaviors, as well as the proportion of their co-occurrences. Socioeconomic status, social capital, and health risk behaviors were important predictors of the elderly's quality of life. Increasing elderly's social capital, so as to prevent and control the occurrence of health risk behaviors, which might be an effective approach to improve the elderly's health.

Background

By the end of 2018, there are 249 million elderly residents aged 60 years and older in China, accounting for 17.9% of the total population [1], and this number is projected to reach 487 million (34.9%) by 2050 [2]. In China, nearly 75% of the elderly people (180 million) suffer from chronic diseases, and 40 million older people live with disability or partially disability, the overall health status of the elderly is not optimistic [3–5]. Identifying the health risk factors, determining factors, and their associated pathways towards health outcomes of the elderly, so as to carry out targeted health interventions, which was thought to be an effective way to achieve elderly health promotion [3, 6].

Health risk behaviors refer to the behaviors of individuals or groups that caused direct or indirect damage to health, well beings, and lifelong quality of life in a direction that deviates from the expectations of individuals, families, schools, and society [7]. According to the World Health Organization (WHO), the impact of personal behavior and lifestyle factors on individual health reached 60% [3], and if health risk behaviors were effectively controlled, at least 80% of all heart diseases, stroke, and type 2 diabetes, as well as 40% of cancer would be prevented [8]. Health risk behaviors, especially unhealthy daily behavioral lifestyles (smoking, alcohol consumption, physical inactivity, overweight or obesity, unhealthy diet, do not use seat belts, etc. [9–12]), were the most important factors affecting the elderly's health [13, 14]. Thus, to clarify the prevalence of health risk behaviors among Chinese elderly population, and conduct targeted behavioral interventions, which might be the most cost-effective health strategy in contemporary China [3, 6].

Social capital is an intangible resource constructed by social relationship that is conducive to the improvement of the quality of life, and a large number of studies have verified the effect [15–19]. For older people, the components of social capital (social networks, social participation, and trust, etc.) were recognized to be associated with their self-rated health, mental health, and depressive symptom [20]. Many researchers have explored the impact and its pathways of social capital on individual health [21–25], and believe that social capital can not only directly affect individual health, but also indirectly affect the health of the elderly through health-related behaviors (especially for daily lifestyle behaviors) [20, 26, 27]. Limited research has explored the impact of social capital on various behaviors, and no consistent finding was reached. Emmering et al. [28] stated that necessary social support from caregivers and others could assist older adults to keep a proper diet, smoking and alcohol cessation. Yun et al. [29] reported that high level of social support may contribute to more smoking behaviors, and no protective effect of intimate social network on smoking behavior was observed among the elderly in rural areas. A recent population-based study investigated the impact of social capital on smoking and drinking behaviors among Chinese elderly population, and found that social trust and social support played protective role in smoking and drinking behavior, and social participation was a risk factor for smoking behavior [30]. However, the impact and its differences of social capital on different health risk behaviors, as well as the effect of social capital on the elderly's health through the mediating of various behaviors were not yet clarified.

The influence of socioeconomic status (SES) on individual health and health risk behavior has been widely reported [31–35]. A recent study based on Chinese elderly population demonstrated that the health disadvantage caused by SES can be mediated by health-related behavior, and the cumulative health disadvantage could be relieved by lifelong health-related behaviors [32]. SES demonstrated quite different associations with various health risk behaviors, low SES population, such as rural elderly, are more likely to report physical inactivity due to poor access to sports resources, but they are less likely to suffer overweight or obesity due to their living and working conditions. Thus, the pathway differences between SES and health risk behaviors are also worth exploring and need to be clarified.

Despite the available research on the possible associations between health risk behaviors, social capital, SES, and HRQoL. Few studies have focused on multiple health risk behaviors, and evaluated the simultaneous role of multiple factors and intermediary determinants of HRQoL, especially in the elderly population. Thus, we conducted this study with the purpose of (a) describing the occurrence of health risk behaviors among Chinese older adults, and (b) assessing the associations between SES, social capital, health risk behaviors, and HRQoL.

Method

Study population

This study designed as a cross-sectional survey, and was conducted from January to March 2018. Convenient sampling was adopted to recruit elderly people aged 60 years and older from both offline and online sources, in Hubei, Jiangxi, Guangdong, and Fujian provinces, etc. The questionnaire was completed by the elderly themselves, and those who cannot complete it themselves were assisted by their family caregivers.

A total of 5542 elderly individuals were initially selected and investigated. Of these, 103 questionnaires were excluded for missing information or obvious logical error. Finally, 5439 older adults were included in the present study.

Concept framework

The conceptual framework of the present study was adapted from the WHO conceptual framework for social determinants of health [36] (Fig. 1). It was expected a priori that structural determinants, including poor socioeconomic status (low education level, low family income), low social capital would predict intermediary determinants (i.e. health risk behaviors in the present study). Structural and intermediary determinants were also expected to predict worse HRQoL. In addition, the intermediary determinants would mediate the relationship between structural determinants and HRQoL.

Variables

Demographic characteristics

Four demographic variables were included as covariates: age, gender, marital status, and place of residence. Age was expressed as a continuous variable. Marital status was dichotomized into married and others (single, divorced, and widowed). Place of residence was divided into rural and urban.

Socioeconomic status (SES)

Socioeconomic status was a latent variable measured by two indicators: education level, family per-capita annual income (CHY), and occupation before retirement. Education level was categorized as: 1 = below elementary school, 2 = elementary school, 3 = middle/high school, and 4 = college and above.

Family per-capita annual income (CHY) was divided into six groups: 1 = $\leq 15,000$, 2 = 15,000–30,000, 3 = 30,000–45,000, 4 = 45,000–60,000, 5 = 60,000–75,000, and 6 = $> 75,000$.

Social capital

Social capital was a latent variable using the dimensions of the 16-item Personal Social Capital Scale (PSCS-16) instrument as indicators [37]. The original PSCS is a novel instrument that was developed with a systematic approach, psychometrically evaluated among adults in China [38]. The PSCS had been validated for Mexican people aged from 18 to 65 years old [39]. The scale contains two subscales: bonding social capital (8 items) and bridging social capital (8 items). Each item applied a 5-point Likert scale: 1 (a few), 2 (less than average), 3 (average), 4 (more than average), and 5 (a lot). The total score of PSCS-16 is obtained by adding up the scores of the items and can vary from 16 to 80. A higher PSCS-16 score indicates greater social capital. We found excellent internal consistency reliability for our sample with Cronbach's $\alpha = 0.964$ and no inter-item correlation lower than 0.423. The Cronbach's α for bonding social capital and bridging social capital were 0.930 and 0.964, respectively.

Health risk behaviors

The present study involved six health risk behaviors: smoking, alcohol consumption, physical inactivity, unhealthy diet, overweight or obesity, and sleep insufficient or excessive. Current smokers were categorized as smoking group. Alcohol consumption was defined as drinking frequency ≥ 1 time per week. According to the definition of "Healthy China 2030", physical inactivity was defined as activity frequency less than 3 times per week or activity duration less than 30 minutes per time [6]. Individuals with unbalanced meat and vegetable intake, or do not eat breakfast were identified as unhealthy diet group. Overweight or obesity was identified as body mass index (BMI) $\geq 24.0 \text{ kg/m}^2$ based on China's criteria of weight for adult [40]. According to the National Sleep Foundation [41], the recommended sleep duration for older adults was 7–8 hours at night, thus, the behavior of sleep insufficient or excessive was defined as sleep duration less than 7 or more than 8 hours at night. The existence of one health risk behavior was assigned 1, otherwise was 0. We calculated the prevalence of each health hazard behaviors, as well as the proportion of their co-occurrences.

Health-related Quality of life (HRQoL)

The outcome of HRQoL was assessed using the WHOQOL-Old [42]. WHOQOL-Old is a well-developed instrument with adequate reliability and validity, and has been widely used to assess HRQoL in many countries [43]. The WHOQOL-Old contains 24 items distributed into six subscales: sensory abilities; autonomy; past, present, and future activities; social participation; death and dying; and intimacy. Each item was scored on a Likert-type scale ranging from 1 to 5, with two subscales (sensory abilities, death and dying) applied reverse scoring. The total score ranges from 24 to 120, with higher score indicates better HRQoL. HRQoL was identified as a latent variable using the scores of each subscale as indicators. The WHOQOL-Old exhibited good internal consistency reliability in the present sample with Cronbach's

alpha = 0.864. The sensory abilities subscale detected relatively low Cronbach's alpha (0.638), while the other five subscales range from 0.855–0.890.

Statistical analysis

The descriptive analysis reported the distribution of the variables through means and standard deviations (SD) (continuous variables) and proportions (categorical variables). Univariate analysis was conducted by ANOVA and Chi-square test. Confirmatory factorial analysis (CFA) was used to evaluate the measurement model involving three latent variables (socioeconomic status, social capital, and HRQoL). Structural equation modeling was used to verify the direct and indirect relationships between observed and latent variables according to the conceptual framework (Fig. 1). Parameters were estimated by the maximum-likelihood method. The evaluation of the model fit was based on the following criteria: standardized root-mean-square residual (SRMR) ≤ 0.08 , comparative fit index (CFI) ≥ 0.90 , goodness of fit index (GFI) ≥ 0.90 and root-mean-square error of approximation (RMSEA) ≤ 0.06 [44]. Data analysis was conducted using IBM SPSS Statistics 22.0 and IBM SPSS AMOS 24.0 software. In all analyses, a two-sided p-value < 0.05 was considered statistically significant.

Results

Descriptive statistics

Descriptive statistics results of the sample are presented in Table 1. A total of 5439 older adults with an average age of 71.0 years old (SD = 7.7) participated in this study. Of these, 50.2% (n = 2729) were female, 67.9% (n = 3694) were married, 77.3% (n = 4202) lived in rural areas, 65.3% (n = 3549) received education level of elementary school or below, 35.7% (n = 1941) reported a family per-capita annual income of less than 15,000 CHY. The overall scores for social capital and HRQoL were 42.3 (SD = 14.5) and 77.7 (SD = 12.3) in this study.

Table 1

Demo-graphic characteristics, socioeconomic status, social capital, health risk behaviors, and health-related quality of life (HRQoL).

Variables	N = 5439
Demo-graphic characteristics	
Age, mean \pm SD	71.0 \pm 7.7
Gender (1 = Male, 0 = Female)	2710 (49.8)
Marital status (1 = Married, 0 = Others)	3694 (67.9)
Place of residence (1 = Rural, 0 = Urban)	4202 (77.3)
Socioeconomic status	
Education level	
<Elementary school	2146 (39.5)
Elementary school	1403 (25.8)
Middle/high school	1481 (27.2)
\geq College	409 (7.5)
Family per-capita annual income (CHY)	
\leq 15,000	1941 (35.7)
15,000–30,000	1392 (25.6)
30,000–45,000	1028 (18.9)
45,000–60,000	578 (10.6)
60,000–75,000	245 (4.5)
> 75,000	255 (4.7)
Social capital	
Bonding social capital, mean \pm SD	22.9 \pm 7.2
Bridging social capital, mean \pm SD	19.4 \pm 8.2
Overall social capital, mean \pm SD	42.3 \pm 14.5
Health risk behaviors	

Continuous variables are presented as mean and standard deviation (SD), categorical variables are presented as frequency (n) and percentage (%). For binary variables, the frequency (n) and percentage (%) of observations coded 1 are presented.

Variables	N = 5439
Smoking (1 = Yes, 0 = No)	1889 (34.7)
Alcohol consumption (1 = Yes, 0 = No)	1872 (34.4)
Physical inactivity (1 = Yes, 0 = No)	3496 (64.3)
Unhealthy diet (1 = Yes, 0 = No)	2445 (45.0)
Overweight/obesity (1 = Yes, 0 = No)	1448 (26.6)
Sleep insufficient/excessive (1 = Yes, 0 = No)	2183 (40.1)
HRQoL	
Sensory abilities, mean \pm SD	12.9 \pm 2.9
Autonomy, mean \pm SD	13.7 \pm 3.3
Past, present and future activities, mean \pm SD	13.1 \pm 3.1
Social participation, mean \pm SD	13.0 \pm 2.9
Death and dying, mean \pm SD	12.2 \pm 3.3
Intimacy, mean \pm SD	12.8 \pm 3.4
Overall HRQoL, mean \pm SD	77.7 \pm 12.3
Continuous variables are presented as mean and standard deviation (SD), categorical variables are presented as frequency (n) and percentage (%). For binary variables, the frequency (n) and percentage (%) of observations coded 1 are presented.	

In terms of health risk behaviors, the prevalence of smoking, alcohol consumption, physical inactivity, unhealthy diet, overweight/obesity, and sleep insufficient/excessive were 34.7%, 34.4%, 64.3%, 45.0%, 26.6%, and 40.1%, respectively. Additionally, the co-occurrence rate of 0–6 health risk behaviors were 6.7%, 18.3%, 27.0%, 26.6%, 14.7%, 5.7%, and 0.9%, respectively.

Univariate analysis

We divided the participants into three groups (0–1, 2–3, and 4–6) according to the co-occurrence number of health risk behaviors. The differences of age, gender, marital status, place of residence, education level, family income, social capital, and HRQoL were significant among three groups (all p-values < 0.05), as presented in Table 2. A total of 1159 (21.3%) older adults had ≥ 4 health risk behaviors. Among these, 66.0% (n = 765) was male, 65.7% (n = 761) was married, 81.0% (n = 939) came from rural areas, 43.1% (n = 500) with an education level of less than elementary school, 43.1% (n = 500) reported a family per-capita annual income of less than 15,000 CHY. In addition, LSD multiple comparison analysis indicated significant lowest scores for social capital and HRQoL in participants with 4–6 health risk behaviors (all p-values < 0.05).

Table 2

Demographics, SES, social capital, and HRQoL among participants with different co-occurrence number of health risk behaviors (0–1, 2–3, and 4–6).

Variables	0–1 (n = 1360, 25.0%)	2–3 (n = 2920, 53.7%)	4–6 (n = 1159, 21.3%)	F/χ^2
Age, mean \pm SD	70.4 \pm 7.6	71.4 \pm 7.9	70.7 \pm 7.5	7.84**
Gender				215.32**
Male	499 (36.7)	1446 (49.5)	765 (66.0)	
Female	861 (63.3)	1474 (50.5)	394 (34.0)	
Marital status				43.52**
Married	1022 (75.1)	1911 (65.4)	761 (65.7)	
Others	338 (24.9)	1009 (34.6)	398 (34.3)	
Place of residence				13.81**
Rural	1019 (74.9)	2244 (76.8)	939 (81.0)	
Urban	341 (25.1)	676 (23.2)	220 (19.0)	
Education level				14.05*
<Elementary school	532 (39.1)	1114 (38.2)	500 (43.1)	
Elementary school	345 (25.4)	784 (26.8)	274 (23.6)	
Middle/high school	367 (27.0)	799 (27.4)	315 (27.2)	
\geq College	116 (8.5)	223 (7.6)	70 (6.0)	
Family per-capita annual income (CHY)				284.90**
\leq 15,000	318 (23.4)	1123 (38.5)	500 (43.1)	
15,000–30,000	269 (19.8)	793 (27.2)	330 (28.5)	
30,000–45,000	352 (25.9)	500 (17.1)	176 (15.2)	
45,000–60,000	243 (17.9)	255 (8.7)	80 (6.9)	

Continuous variables are presented as mean and standard deviation (SD), categorical variables are presented as frequency (n) and percentage (%).

*p < 0.05, **p < 0.01

Variables	0–1 (n = 1360, 25.0%)	2–3 (n = 2920, 53.7%)	4–6 (n = 1159, 21.3%)	F/ χ^2
60,000–75,000	96 (7.1)	114 (3.9)	35 (3.0)	
> 75,000	82 (6.0)	135 (4.6)	38 (3.3)	
Social capital, mean \pm SD	46.3 \pm 13.7	41.4 \pm 14.3	39.8 \pm 14.9	76.41**
HRQoL, mean \pm SD	78.0 \pm 9.4	75.0 \pm 11.9	73.5 \pm 11.9	52.99**
Continuous variables are presented as mean and standard deviation (SD), categorical variables are presented as frequency (n) and percentage (%).				
*p < 0.05, **p < 0.01				

SEM results

The results of CFA indicated that the measurement model fitted the data quite well (SRMR = 0.0674, GFI = 0.97, AGFI = 0.94, CFI = 0.95, RMSEA = 0.08), as shown in Table 3.

Table 3
Confirmatory factor analysis (CFA) results for measurement model.

Latent construct	Manifest variable	Standardized factor loading	p-value
SES	Education level	0.59	< 0.001
	Family income	0.56	< 0.001
Social capital	Bonding social capital	0.97	< 0.001
	Bridging social capital	0.79	< 0.001
HRQoL	Sensory abilities	0.64	< 0.001
	Autonomy	0.85	< 0.001
	Past, present and future activities	0.88	< 0.001
	Social participation	0.85	< 0.001
	Death and dying	0.06	< 0.001
	Intimacy	0.62	< 0.001
Model fit statistics for CFA: SRMR = 0.0674, GFI = 0.97, AGFI = 0.94, NFI = 0.95, IFI = 0.95, TLI = 0.93, CFI = 0.95, RMSEA = 0.08.			

Figure 2 demonstrates the results of structural modeling. According to the SEM results, the HRQoL score exhibited negative associations with smoking ($\beta = -0.07$, $p < 0.001$), physical inactivity ($\beta = -0.29$, $p <$

0.001), and unhealthy diet ($\beta = -0.07$, $p < 0.001$), positive associations with overweight or obesity ($\beta = 0.06$, $p < 0.001$), sleep insufficient or excessive ($\beta = 0.041$, $p < 0.001$), social capital ($\beta = 0.08$, $p < 0.001$), and SES ($\beta = 0.50$, $p < 0.001$). No significant association was found between alcohol consumption and HRQoL. Social capital performed positive association with alcohol consumption ($\beta = 0.02$, $p < 0.05$) and sleep insufficient or excessive ($\beta = 0.30$, $p < 0.001$), negative association with physical inactivity ($\beta = -0.18$, $p < 0.001$), unhealthy diet ($\beta = -0.21$, $p < 0.001$), and overweight or obesity ($\beta = -0.20$, $p < 0.001$). The model also showed an interrelationship between SES and social capital ($\beta = 0.65$, $p < 0.001$).

Discussion

The present study attempted to describe the occurrence of health risk behaviors among Chinese older adults, and explored the associations between socioeconomic status, social capital, health risk behaviors, and HRQoL. In this study, the smoking rate was 34.7% in this sample, much higher than the Chinese Center for Disease Control and Prevention reported in adults aged 15 years and older (26.6%) [45]. The prevalence of physical inactivity and unhealthy diet were 64.3% and 45.0%, at a relatively high level. Individuals' health behavior has an apparent feature of clustering [46, 47], and elderly people were at high risk for the co-occurrence of multiple health risk behaviors affected by their physiological decline and solidified habits [48]. This study showed that three quarters of the elderly suffered two or more health risk behaviors, indicating a serious clustering of health risk behaviors in Chinese elderly population. We also found that males and individuals live in rural areas, with low education level, with low family income were more likely to catch multiple health risk behaviors, suggesting that these elderly people were the key population for behavioral interventions.

The present study explored the associations between health risk behaviors and HRQoL. Smoking, physical inactivity, and unhealthy diet could significantly reduce the elderly's HRQoL, which is in consistent with Zhang et al. [49] Contrary to former findings that [50, 51], this study observed significant positive association between the occurrence of overweight or obesity and increasing HRQoL in older people. The reason might be that most of the participants (77.3%) came from rural areas, and being overweight or obese represents relatively good living conditions, thus these individuals had a better quality of life. We found interesting and abnormal results that the occurrence of sleep insufficient or excessive positively associated with increasing HRQoL. This might due to the limitation that the definition of sleep insufficient or excessive only considered sleep duration at night in this study. Subsequent research was necessary to conduct in-depth exploration and analysis regarding this issue. This study did not observe significant association between alcohol consumption and HRQoL, suggesting that the behavior of alcohol consumption performed relatively weak effect on the elderly's quality of life. Han et al. [52] reported similar findings. However, it might also be a false negative result due to the fact that we did not consider the degree of alcohol consumption in this study.

The protective role of social capital on individual health has been previously verified [15]. Consistently, the present study demonstrated significant association between higher level of social capital and increasing HRQoL. We detected the association between social capital and health risk behaviors, and found that

elderly with more co-occurrence number of health risk behaviors experienced lower social capital. Concretely, social capital negatively correlated with the occurrence of physical inactivity, unhealthy diet, and overweight or obesity. The finding was in consistent with Han et al. [52] and Poortinga et al. [24], indicating that social capital (social support, social participation, and social trust et al.) could contribute older people to adopt health-promoting behaviors and reduce health risk behaviors. It's recommended that the Chinese traditional culture of "filial piety" should be advocated in contemporary China, so as to encourage offspring to visit, accompany and give more spiritual and emotional comfort to the elderly. Besides, the government and society should promote the construction of a formal social support system, such as long-term care insurance for the elderly and pension industry. Social capital was reported positively correlated with alcohol consumption, sleep insufficient or excessive, and declared no significant correlation with smoking. Emmering et al. [53] mentioned the similar results. In China, alcohol consumption and smoking are common social communication and business entertainment behaviors, and even usually considered as social etiquettes. Previous research has confirmed the positive relationship between social participation and alcohol consumption behavior, and the promoting of "peer effect" on smoking behavior [30]. The association between sleep behavior and social capital was still controversial [54]. It might be related to the fact that sleep as a private activity is less susceptible to be influenced and controlled by social capital. In general, social capital played positive role in decreasing the occurrence of health risk behaviors, but its association with different behaviors was quite different. For some health risk behaviors (physical inactivity, unhealthy diet, and overweight or obesity, et al.), improving social capital might be an effective approach. While for other behaviors (such as sleep), the role of social capital may be small.

Socioeconomic status was closely linked to the quality of life and the occurrence of health risk behaviors, older people with high education level and family income were usually demonstrated better health status [55, 56]. This study also found that higher socioeconomic status associated with better quality of life and lower occurrence of physical activity, unhealthy diets, and sleep insufficient or excessive. Thus, the elderly with low socioeconomic status should be specially focused, when it comes to health promotion and health risk behaviors intervention.

Several potential limitations should be mentioned regarding the present study. Firstly, participants recruited by convenience sampling from both offline and online sources, and mainly conducted in Hubei, Jiangxi, Guangdong, and Fujian provinces, which may not be able to fully represent the whole of China. Secondly, this study followed a cross-sectional design, thus the results can only show connections among the factors rather than give a causal inference. For example, some elderly people with impaired body function (i.e. poor HRQoL) may be likely to control their health risk behaviors (quit smoking, limit alcohol consumption, lose weight, etc.). Thirdly, previous studies have indicated the apparent clustering of health risk behaviors, for example, smoking and drinking, physical inactivity and overweight or obesity tended to aggregate and co-occur [47]. While in the present study, we did not consider the interaction between different behaviors. In addition, due to the survey contents and indicators, the definition of health risk behaviors in this study might have limitations. For example, the definition of smoking did not take into account smoking amount and quitters, the definition of sleep insufficient or excessive only

considered sleep duration at night. Despite these limitations, this study illustrated the associations of the elderly's social capital, health risk behaviors, and HRQoL by constructing a structural equation model. The results may provide inspirations for the current implementation of "Elderly Health Promotion Action" in China [3], and contribute references for subsequent research.

Conclusion

Three quarters of the elderly suffered two or more health risk behaviors in China. The occurrence of health risk behaviors (especially for smoking, physical inactivity, and unhealthy diet) as well as their co-occurrences significantly contributed to the decline of the elderly's HRQoL. Social capital positively associated with older adults' HRQoL and participants with higher social capital were less likely to adopt the behavior of physical inactivity, unhealthy diet, and overweight or obesity. Older adults with higher socioeconomic status exhibited better quality of life, and less prevalence of physical inactivity, unhealthy diet, and sleep insufficient or excessive. It's recommended to pay more attention to older adults' health risk behaviors, particularly for males and those with low socioeconomic status (low education level, low family income, and live in rural areas). Families, communities, and the government should work together to improve the accessibility of social resources for the elderly, promote their social support, social participation, and social trust, so as to achieve the "Healthy China" construction goal of promoting elderly health.

Declarations

Ethics approval and consent to participate

The present study was reviewed and approved by the Ethics Committee of Medical Department, Wuhan University (IRB: No 2019YF1050). The participants were guaranteed no risk involved in participating in the survey. Informed consent information was attached on the top of each questionnaire and presented before the survey. All participants were required to complete and sign the informed consent documents.

Consent for publication

Not applicable

Availability of data and materials

The datasets generated during and/or analyzed during the current study are available from the corresponding authors on reasonable request.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

DC and ZM designed the study. LC, ML, and LX collected data, YY, SW, and LC analyzed and interpreted the data. YY and SW drafted the manuscript. DC supervised the study and critically revised the manuscript for important intellectual content and final approval of the version to be published. All authors have read and approved the manuscript.

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Abbreviations

BMI
Body Mass Index; CFA:Confirmatory Factorial Analysis; HRQoL:Health-related Quality of Life;
PSCS:Personal Social Capital Scale; SD:Standard Deviations; SEM:Structural Equation Model;
SES:Socioeconomic Status; WHO:World Health Organization.

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Figures

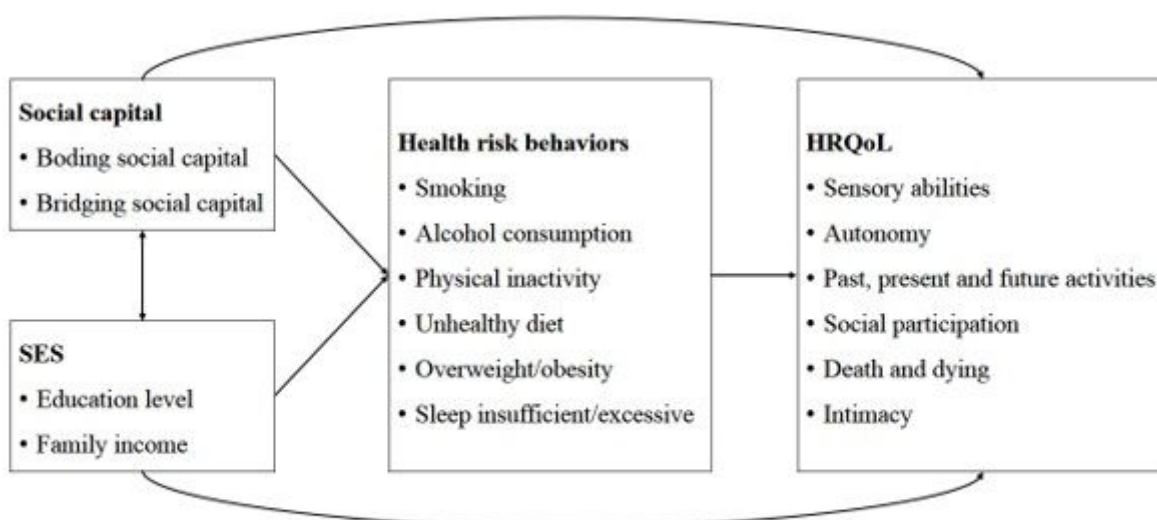


Figure 1

Conceptual framework of the associations between socioeconomic status, social capital, health risk behaviors, and HRQoL.

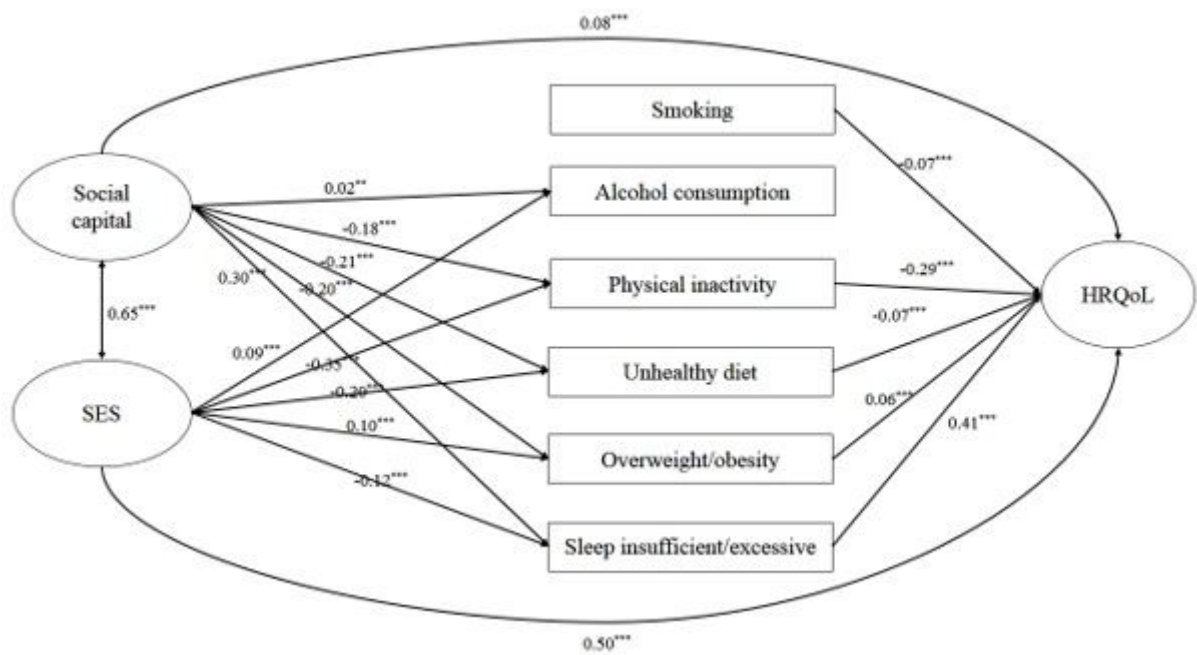


Figure 2

Structural model of association between socioeconomic status, social capital, health risk behaviors, and HRQoL. Note: numbers in the figure represent standardized path coefficients. ***p < 0.001; **p < 0.05.