

## **The relevant factors of the limited health literacy among Chinese elderly adults: A systematic review**

Guo Kun<sup>1</sup>, Zhang Xiaoye<sup>2,3</sup>, Halimatus Sakdiah Minhat<sup>1</sup>, Ouyang Jing<sup>2</sup>, Suhainizam

Muhamad Saliluddin<sup>1</sup>

<sup>1</sup>Department of community health, Faculty of medicine & health sciences, Universiti Putra Malaysia.

<sup>2</sup>College of humanities and management, Shaanxi University of Chinese medicine.

<sup>3</sup>Medical experiment center, Shaanxi University of Chinese medicine.

\*Corresponding author E-mail : [suhainizam@upm.edu.my](mailto:suhainizam@upm.edu.my)

### **Abstract**

Health literacy means that people have specific knowledge, personal skills, and confidence, and they can take action to improve individual ability to use the information to promote good health. Limited health literacy is related to using preventive services, delaying diagnosis, understanding the medical condition, following medical instructions, and self-management skill. The elderly Chinese population is increasing rapidly. This article is a systematic review use to identify the relevant factors of limited health literacy among older adults living in mainland China. After searching and screening articles, there are seven articles included in this systematic review. From this systematic review have found that many factors associated with limited health literacy among older adults in China, and the factors involved in age, gender, race, marital condition, education, income, former occupational, health behavior, cognitive, chronic disease, and social support.

**Keywords:** health literacy; older adults; China

### **1.Introduction**

The Chinese population is aging rapidly. In 2018, China had 249 million older adults who are over 60 years old, and the elderly accounting for 17.9% of the total population in China. However, compared with the first time became an aging society of China in 1999, which of the net increase of about 120 million older adults (Feng et al., 2019). In the next 25 years, the proportion of people aged above 60 years in China will arrive at 28% (402 million) in 2040(Tiller et al., 2015a). The pace of older adults increased in China is faster than in many other countries(Wang et al., 2017). The rate of increase in the elderly population compared to other countries, such as Sweden had taken 85 years, and France had taken 115 years(WHO, 2015). The average life expectancy who birth in China from 44.6 years in 1950 and rise to 75.3 years in 2015, and it is expected to be about 80 years by 2050 (Nations, n.d.). By 2050, the population of the age above 80 years will increase to 90.4 million and China will become the world's largest population of the elderly age group(Department of Economic and Social Affairs Population Division World Population Ageing 2013 United Nations • New York, 2013, n.d.). The main problem related to the aging population is associated with the burden of chronic

disease. As the population ages further, age-related diseases such as cardiovascular disease, cancer, chronic respiratory diseases, musculoskeletal diseases, and mental disorders are likely to increase (Prince et al., 2015). The burden of chronic disease is more likely to cause disability than mortality, and disability requires long-term care costs. To improve older adults' ability to prevent chronic diseases, it is necessary to enhance older adults' health literacy.

World Health Organization (WHO) defined health literacy as "cognitive and social skills that determine the individual's ability to understand and use information in ways which promote and maintain good health" (Health promotion glossary, 1998; "WHO | The WHO Health Promotion Glossary," 2019). In previous studies have shown that lower health literacy levels have unhealthy outcomes, such as frequent hospitalizations, and lower living quality (Geboers et al., 2016). Limited health literacy is related to using preventive services, delaying diagnosis, understanding the medical condition, following medical instructions, and self-management (Leslie et al., 2019). Although estimates vary, lower health literacy of older adults has predictor higher health care costs (Wolf et al., n.d.). Limited health literacy affects people's health by restricting their personal, social, and cultural development, and hinders the development of health literacy directly (Coman et al., 2020). Limited health literacy also affects older adults' ability to get benefit from health care services. It is believed that health literacy plays a crucial role in the development of chronic diseases and the risk of their mediation, especially the disorders which closely related to social factors (Tiller et al., 2015b). Chronic diseases need individuals to make significant decisions on daily life, so health literacy as an essential factor leading to these diseases. Physical impairments of older adults, such as hearing and vision loss also lead to a decline in the ability to process health information. Psychosocial factors such as economic income and coping styles may hurt older adults understanding of medical instruction (Leung et al., 2013). In the USA, there have at least 59% of older adult access to health knowledge were difficult (Geboers et al., 2018). By improving the ability of the elderly to obtain health information and use it effectively, health literacy is essential to enhance people's ability to use health information on people's daily life.

There are no published systematic reviews regarding limited health literacy among older adults living in mainland China. This systematic review identified the factors relevant to the limited health literacy of the elderly living in mainland China.

## **2. Methods**

### **2.1 Data sources and search strategy**

The literature review of this systematic followed the Preferred Reporting Items for Systematic review (Liberati et al., 2009). In this systematic review, we use the PRISMA flowchart (figure.1) to describe the literature screening procedures (Shamseer et al., n.d.).

A series of databases in Medline, PubMed, Scopus were performed by two independent researchers to search the articles. The articles were searched from Oct 2019 to April 2020. The search results compared and merged to obtain information regarding a research question: What are the factors relevant to the limited health literacy of older adults?

To retrieve studies, use the keywords to search the articles from the database were "health literacy OR literacy, health" AND "factors OR factors associate with OR predictors OR predicting factors" AND "elderly people OR older adults OR geriatric population OR senior citizens" AND "Chinese OR China".

## **2.2 Study inclusion criteria and study exclusion criteria**

Screening articles according to the inclusion criteria are include the sample of adults who aged above 60 years old and above; the participants had limited health literacy situation; the articles analyzed the health literacy as an outcome variable and assessed the factors associated with limited health literacy.

The exclusion criteria of selection articles include review/discussion articles, case studies, tool development, and the theme of medical education studies and mental health literacy. Duplicate studies were identified and removed through Mendeley 1.19.4.

## **2.3 Quality assessment**

Two reviewers (GK and ZXY) independently assessed the articles in the database we had chosen and following the inclusion criteria. Any disagreements were discussed and resolved by the third reviewer (SMS). From the materials we had selected in this systematic review, we extracted the instrument of measure health literacy, the characteristic of the samples, data collection, and the results of the articles. There was no meta-analysis conducted in this systematic review.

## **3.Result**

### **3.1Flow of included studies**

The number of 310 articles were selection from the database for this systematic review was using the inclusion and exclusion criteria (Figure 1). One hundred thirty articles were excluded according to the study time, population age, lack of health literacy measures, case studies, health literacy instrument development, medical education studies, and mental health literacy. In the remaining 34 articles, after full-text evaluation according to the inclusion criteria their have seven articles remained. Study design, sample size, target population, data collection method, the factors relevant to limited health literacy were selected from each of these studies (Table 1).

### **3.2 Place of residence**

All studies in this systematic review focused on Chinese elderly older adults' literacy. Although all of the studies included in this systematic review were conducted in China, the study settings were geographically diverse, including west part of China (Xin Jiang province)(Y. Liu et al., 2015; Y.-B. Liu et al., 2018; Yong-Bing Liu et al., 2015), Southwest part of China (Sichuan province) (Yang et al., 2019), east part of China (Jiangsu province)(Y. B. Liu et al., 2019), Central part of China (Hunan province)(Qin & Xu, 2016), Chinese elderly migrate to other countries (Chicago, USA)(Simon et al., 2014).

### **3.3 Study Characteristics**

The sample size of these studies ranged from 412 to 3159 participants. Based on the data of the included studies, a total of 10442 elderly older adults. The studies of all the participants in these studies aged above 60 years and age ranged between 60 and 101 years. Most of the studies (n=6)

included in this systematic review used a cross-sectional study design; only one was a cohort study design.

### **3.4 Screening instruments for health literacy among older adults in China**

Methods of health literacy measurement differed between studies and measured several domains of health literacy. Five articles used Chinese Citizen Health Literacy Questionnaire, one article used the questionnaire of health literacy of diabetes mellitus of the public in China (QHLDMP), and another one article used the Chinese version of the Rapid Estimate of Adult Literacy in Medicine, Revised (REALM-R) test. Chinese citizen health literacy questionnaire included four dimensions (belief, knowledge, behavior, and skill literacy); QHLDMP assessed diabetes-related knowledge, diabetes-related behavior, and the acquisition and utilization of diabetes information; REALM-R test asked participants to read 11 items written in Chinese: Fat, Flu, Pill, Osteoporosis, Allergic, Jaundice, Anemia, Fatigue, Directed, Colitis, and Constipation. Use these tools to test participants' health literacy, and receiving a lower score were categorized as having a low literacy level.

### **3.5 Key factors relevant to limited health literacy of elderly Chinese people**

All the studies we included have examined the factors associated with health literacy among Chinese older adults. From table 1 found the articles characteristics on health literacy among Chinese older adults. Seven articles are epidemiological studies that focused on the factors associated with health literacy among Chinese older adults. The factors associated with health literacy were summarized in table 2.

From table 2 found that age, gender, race, marital status, education, income, former occupation as the demographic characteristics can affect health literacy among Chinese older adults. Health behavior such as alcohol consumption, smoking, the activity of daily living (ADL), health belief, physical exercise, health examination can influence the level of health literacy among Chinese older adults. From this review have proved social support can provide elderly people with a source of support include caring, health information receiving, and so on. Compare to young people, older adults are more likely to suffer from chronic diseases. In the current review found chronic disease as the main factors that influence limited health literacy among Chinese older adults. Poor cognitive ability is related to poor health outcomes of chronic disease and lower health literacy levels (O'Connor et al., 2019). Elderly people had poor medication knowledge and disease awareness with low health literacy. One study in this review found that elderly people with mild cognitive impairment have limited health literacy risks. Yong B. Liu et al. found that mild cognitive impairment is an important factor influencing health literacy level, and age-related cognitive function decline may act as an indicator for lower health literacy for future health outcomes. Therefore, cognitive dysfunction can affect the health literacy level of the Chinese elderly have examined in this study.

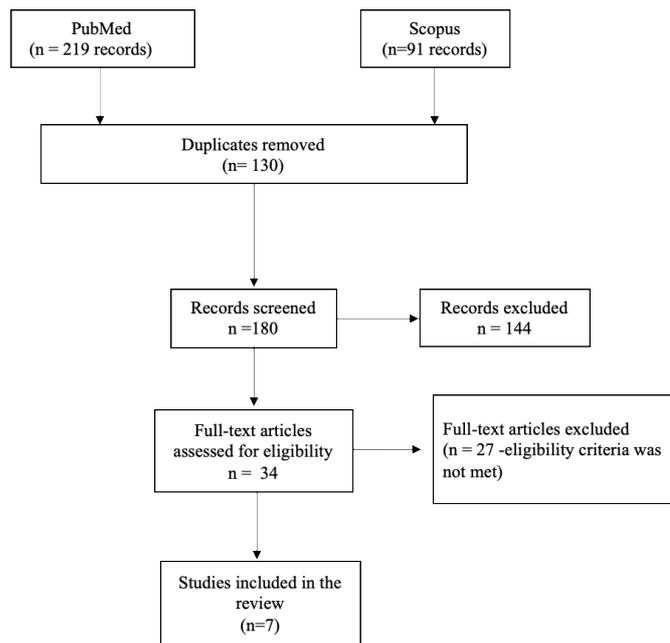


Figure 1. Review flowchart.

Table 1. Characteristics of included studies.

	study site	study design	sample size	Results	factors associated with limited health literacy among older adults
Yongbing Liu, et al. 2018	Xinjiang province	cross-sectional	1396	1. Health literacy level with chronic disease have significant statistically ( $t=7.462, p<0.001$ ) 2. Health literacy was influenced by smoking ( $t=10.851, p<0.001$ ), alcohol consumption ( $t=10.149, p<0.001$ ), ADL ( $t=8.107, P=0.004$ ).	1. Chronic disease 2. Activity of Daily Living (ADL) 3. Smoking 4. Alcohol consumption
QinLulu, et al. 2016	Yiyang city, Hunan	cross-sectional	434	1. Males had lower health literacy scores than women (9.0 vs. 11.0, $p<0.05$ ). 2. The elderly health literacy scores were higher in a stable marriage than those in unstable marriages (10.0 vs. 9.0, $p<0.05$ ). 3. Elderly individuals who had a higher education level can prevent diabetes better than those elderly who had less than one year of education (8.0 vs. 11.0 vs. 12.0, $p<0.05$ ). 4. The elderly health literacy scores associate with the history of chronic disease (12.5 vs. 9.0, $p<0.05$ ).	1. male 2. unstable marriages 3. not having a history of chronic disease 4. low educational level.
Yongbing Liu, et al. 2019	Jiangsu province	cross-sectional	412	1. The elderly with normal cognitive function had higher health literacy levels than those with mild cognitive impairment ( $p < 0.05$ ). 2. Basic health knowledge and mind, basic skills, and healthy lifestyle and behavior were associated with mild cognitive impairment that influences health literacy scores. ( $p < 0.05$ ).	1. mild cognitive impairment 2. health knowledge, basic skills and health behavior
Yikai Yang, et al. 2019	Chengdu, Sichuan province	cross-sectional	992	Social support was related to health outcomes directly ( $\beta = 0.119, 95\% \text{ CI: } 0.041-0.198$ ). 2. Health literacy had direct associations with social support ( $\beta = 0.327, 95\% \text{ CI: } 0.175-0.479$ ), and health literacy had a direct association with productive aging ( $\beta = 0.676, 95\% \text{ CI: } 0.604-0.748$ ).	1. social support 2. productive aging
Melissa A. Simon, et al. 2014	Chicago, USA	cohort study	3159, 95% of them do not speak or read English	1. Males had higher health literacy scores on the REALM-R test than females (7.4 vs. 6.5, $p < .001$ ). 2. Chinese elderly who had stayed in the United States for less than ten years had higher health literacy scores of REALM-R scores than those who have been in the United States for 11–20 years, 21–30 years, and 31 years and over (7.2 vs. 6.9 vs. 6.6 vs. 6.8, $p < .001$ ) 3. Education and health literacy had significant statistics ( $r = .56, p < .001$ ).	1. gender. 2. Immigration time 3. education
Yongbing Liu, et al. 2015	Xinjiang province	cross-sectional	1396	1. health literacy was related to education, race, former occupation, household income, age, and marital status ( $P < 0.05$ ). 2. Health knowledge had the highest correlation with health literacy scores ( $r=0.95$ ), health belief correlated with health literacy scores ( $r=0.81$ )	1. education 2. race 3. former occupation 4. household income 5. age 6. marital status 7. health knowledge 8. health belief 9. health behavior
Yongbing Liu, et al. 2015	Xinjiang province	cross-sectional	1396	1. The health literacy score was significant with age, gender, race, education level, household income, marital conditions, and former occupation ( $p < 0.001$ ). 2. The health literacy score was significant with smoking, drinking, physical exercise, and health examination ( $p < 0.001$ ).	1. age 2. gender 3. race 4. education level. 5. household income 6. marital conditions 7. former occupation 8. smoking 9. drinking 10. physical exercise 11. health examination.

Table 2. The factors associated with health literacy among older adults in Chinese people.

factors associated with health literacy	Yongbing Liu et al,2018	Qin Lulu et al,2016	Yongbing Liu et al,2019	Yikai Yang et al,2019	Melissa A. Simon et al,2014	Yongbing Liu et al,2015	Yongbing Liu et al,2015
age			√			√	√
gender		√			√		√
race						√	√
marital status		√	√			√	√
education		√	√		√	√	√
income						√	√
former occupation							√
health behavior			√			√	
health belief						√	
physical health						√	
alcohol consumption	√						√
smoking	√						√
BMI			√				
activity of daily living	√						
health examination							√
physical exercise							√
chronic disease	√	√					
cognitive			√				
social support				√			
productive aging				√			
immigration time					√		

#### 4. Discussion

This review synthesized literature on the factors relevant to the limited health literacy of Chinese elderly people. Across the studies included in this systematic review, there was one cohort study and six cross-sectional studies. The variables associated with health literacy were evaluated in this review included age, gender, race, marital condition, education, income, former occupation, health behavior, health belief, physical health, alcohol consumption, smoking, BMI, activity of daily life (ADL), health examination, physical exercise, chronic disease, cognitive, social support, productive aging, immigration time.

Different gender has different health literacy level in this studies review; one article in this review included found females had higher diabetes health literacy than males, and two articles recognized males had higher health literacy scores than females. This inconsistency is also found in the studies conducted in Korean (Lee et al., 2015). The higher health literacy of female than male may be associated with female's traditional role need take care of the sick family members in the family, and woman pays more attention to a health system that has more chances to learn health knowledge and thus resulting woman have higher health literacy levels than those of men. The higher health literacy of male than female may be associated with females would occur more depressive symptoms and chronic diseases than males, a previous research report that females have more health issues, and they need to use higher medical service utilization than males(Wenjuan et al., 2019). In general, females had lower socioeconomic and health status than males, and the income as a factor may affect women's mood in daily life. However, previous studies also have recognized men have more depressive symptoms than women(Ko et al., 2019). Therefore, the gap between females and males in health literacy according to the national background, access to health information, and styles

of cope with health issues factors. Education means people can get more knowledge and skills. The most consistent studies collected the association between health literacy and education. Similarity from these articles include in this review, elderly who have a higher education level would have a higher health literacy level. That is because elderly people who have higher education could improve them to judge health information and makes them have a good health outcome (Xie et al., 2019).

Income and former occupation as a part of the factor affect the health literacy of elderly Chinese people have been highlighted in two studies of this review. The health literacy was effect by income status, as well as good income have a higher health literacy score, and poor income have a lower health literacy level; this is also consistent with other studies(Todorovic et al., 2019). The different former occupational types of elderly people would have different health behavior modification. For example, the elderly who worked in the public institution before the age of 60 was 39.5% lower than those who worked as commercial, service or industrial staff before the age of 60; the elderly people who worked in agricultural before the age of 60 is notably higher than those who worked in commercial, service, or industrial jobs before the age of 60 (Feng et al., 2019). The analysis of these articles included in this review proved that former occupational could affect the health behaviors of the elderly Chinese people, and the elderly people's health behavior can affect health literacy levels. Therefore, the former occupational can affect elderly people's health literacy level.

Health literacy levels were related to health behaviors in the current review. Health behaviors include alcohol consumption, smoking, and do exercise of people's behavior in daily life. Health behaviors determined the health outcome of elderly people. The current review indicates that Chinese elderly people need to conduct various forms of health education by improving self-discipline on their health behaviors. Family members and friends should discover the unhealthy behavior of elderly people in daily life and urge them to modify unhealthy behaviors. Health literacy was related to social support in the current review. Social support refers to "the support from family members, friends, and others that make people have good psychological, physical, financial, or other kinds of help" (Amoah, 2019). In the articles that we included in this review, social support with a positive effect on health, but inappropriate social support also can generate adverse effects on health outcomes. For example, inappropriate social support also can add more unreasonable pressure and provide misinformation to people that lead psychological distress to the elderly. Therefore, social support is an important factor for the health literacy level of elderly Chinese people.

In this review has demonstrated that health literacy level was correlated with chronic disease. Up to 80% of USA elderly adults have at least one chronic disease and have a higher comorbidity rate of them (Findley, 2015). If elderly people have a chronic disease that will affect people's quality of life and will increase healthcare costs. To prevent complications of elderly people, health literacy as an important factor for self-care, which need sufficient health knowledge to manage their chronic diseases (Kim & Youn, 2015). For the management of chronic diseases, nearly 50% of patients cannot follow medical instructions (Miller, 2016). To improve their skills to cope with chronic disease, elderly people need to understand the health information related to their diseases. This understanding of medical instruction was necessary

for them to generate beliefs and build appropriate health behaviors to improve their health outcomes.

Limited health literacy linked with infrequent health examination, delays in diagnoses, cannot follow medical instructions, inadequate self-management skills (Wolf et al., 2010). On-time physical examination also requires a good cognitive state. Health literacy level is related to cognitive function and is determined by the individual's ability to access health information (Oliveira et al., 2019). The current review found that mild cognitive impairment may be correlated with the low health literacy level of elderly Chinese people.

## 5. Conclusion

This article is a systematic review was conducted to find the factors associated with health literacy among Chinese older adults. The aims of this systematic review was summarize the existing articles from some database and found the factors associated with limited health literacy of elderly Chinese people. After screening and looking for eligible articles based on the inclusion criteria that have seven articles included in this systematic review. From this research found that there were many factors that affect the health literacy level of elderly Chinese people, and the factors involved in age, gender, race, marital condition, education, income, former occupation, health behavior, health belief, physical health, alcohol consumption, smoking, BMI, activity of daily life (ADL), health examination, physical exercise, chronic disease, cognitive, social support, productive aging, immigration time.

**Acknowledgement:** This systematic review was supported by grants from 1. The New Style Think Tank of Shaanxi Universities: 'The Belt and Road' Research Center for Health Development of Traditional Chinese Medicine. 2. Shaanxi University of Chinese Medicine Innovation Team 2019-PY04.

## Reference:

- Amoah, P. (2019). The Relationship between Functional Health Literacy, Self-Rated Health, and Social Support between Younger and Older Adults in Ghana. *International Journal of Environmental Research and Public Health*, 16(17), 3188.  
<https://doi.org/10.3390/ijerph16173188>
- Coman, M. A., Marcu, A., Chereches, R. M., Leppälä, J., Van, S., & Broucke, D. (2020). *Educational Interventions to Improve Safety and Health Literacy Among Agricultural Workers: A Systematic Review*.  
<https://doi.org/10.3390/ijerph17031114>
- Department of Economic and Social Affairs Population Division World Population Ageing 2013 United Nations • New York, 2013. (n.d.).
- Feng, Y., Liu, E., Yue, Z., Zhang, Q., & Han, T. (2019). The evolutionary trends of health behaviors in Chinese elderly and the influencing factors of these trends: 2005-2014. *International Journal of Environmental Research and Public Health*, 16(10).  
<https://doi.org/10.3390/ijerph16101687>

- Findley, A. (2015). Low Health Literacy and Older Adults: Meanings, Problems, and Recommendations for Social Work. *Social Work in Health Care*, 54(1), 65–81.  
<https://doi.org/10.1080/00981389.2014.966882>
- Geboers, B., de Winter, A. F., Spoorenberg, S. L. W., Wynia, K., & Reijneveld, S. A. (2016). The association between health literacy and self-management abilities in adults aged 75 and older, and its moderators. *Quality of Life Research*, 25(11), 2869–2877.  
<https://doi.org/10.1007/s11136-016-1298-2>
- Geboers, B., Uiters, E., Reijneveld, S. A., Jansen, C. J. M., Almansa, J., Nooyens, A. C. J., Verschuren, W. M. M., de Winter, A. F., & Picavet, H. S. J. (2018). Health literacy among older adults is associated with their 10-years' cognitive functioning and decline - The Doetinchem Cohort Study. *BMC Geriatrics*, 18(1). <https://doi.org/10.1186/s12877-018-0766-7>
- Health promotion glossary*. (1998).
- Kim, S. H., & Youn, C. H. (2015). Efficacy of chronic disease self-management program in older Korean adults with low and high health literacy. *Asian Nursing Research*, 9(1), 42–46. <https://doi.org/10.1016/j.anr.2014.10.008>
- Ko, H., Park, Y. H., Cho, B. L., Lim, K. C., Chang, S. J., Yi, Y. M., Noh, E. Y., & Ryu, S. I. (2019). Gender differences in health status, quality of life, and community service needs of older adults living alone. *Archives of Gerontology and Geriatrics*, 83, 239–245.  
<https://doi.org/10.1016/j.archger.2019.05.009>
- Lee, H. Y., Lee, J., & Kim, N. K. (2015). Gender Differences in Health Literacy Among Korean Adults: Do Women Have a Higher Level of Health Literacy Than Men? *American Journal of Men's Health*, 9(5), 370–379.  
<https://doi.org/10.1177/1557988314545485>
- Leslie, C., Smith, D., & Nicholas, P. (2019). Health Literacy Understanding of Early Intervention Providers: A Scoping Review. *Journal for Nurse Practitioners*, 15(9), 640–648. <https://doi.org/10.1016/j.nurpra.2019.06.006>
- Leung, A. Y. M., Cheung, M. K. T., Lou, V. W. Q., Chan, F. H. W., Ho, C. K. Y., Do, T. L., Chan, S. S. C., & Chi, I. (2013). Development and validation of the Chinese Health Literacy Scale for Chronic Care. *Journal of Health Communication*, 18 Suppl 1, 205–222. <https://doi.org/10.1080/10810730.2013.829138>
- Liberati, A., Altman, D. G., Tetzlaff, J., Mulrow, C., Gøtzsche, P. C., Ioannidis, J. P. A., Clarke, M., Devereaux, P. J., Kleijnen, J., & Moher, D. (2009). The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate healthcare interventions: explanation and elaboration. *BMJ (Clinical Research Ed.)*, 339.  
<https://doi.org/10.1136/bmj.b2700>
- Liu, Y. B., Chen, Y. L., Xue, H. P., & Hou, P. (2019). Health Literacy Risk in Older Adults With and Without Mild Cognitive Impairment. *Nursing Research*.  
<https://doi.org/10.1097/NNR.0000000000000389>
- Liu, Y., Wang, Y., Liang, F., Chen, Y., Liu, L., Li, Y., Yao, H., & Chu, Q. (2015). The Health Literacy Status and Influencing Factors of Older Population in Xinjiang. *Iranian Journal of Public Health*, 44(7), 913–919.

- Liu, Y.-B., Xue, L.-L., Xue, H.-P., & Hou, P. (2018). Health Literacy, Physical and Mental Health, and Activities of Daily Living Among Older Chinese Adults in Nursing Homes. *Asia-Pacific Journal of Public Health*, 30(6), 592–599. <https://doi.org/10.1177/1010539518800368>
- Liu, Yong-Bing, Liu, L., Li, Y.-F., & Chen, Y.-L. (2015). Relationship between Health Literacy, Health-Related Behaviors and Health Status: A Survey of Elderly Chinese. *International Journal of Environmental Research and Public Health*, 12(8), 9714–9725. <https://doi.org/10.3390/ijerph120809714>
- Miller, T. A. (2016). Health literacy and adherence to medical treatment in chronic and acute illness: A meta-analysis. In *Patient Education and Counseling* (Vol. 99, Issue 7, pp. 1079–1086). Elsevier Ireland Ltd. <https://doi.org/10.1016/j.pec.2016.01.020>
- Nations, U. (n.d.). *World Population Prospects The 2012 Revision Highlights and Advance Tables*.
- O’Conor, R., Muellers, K., Arvanitis, M., Vicencio, D. P., Wolf, M. S., Wisnivesky, J. P., & Federman, A. D. (2019). Effects of health literacy and cognitive abilities on COPD self-management behaviors: A prospective cohort study. *Respiratory Medicine*. <https://doi.org/10.1016/j.rmed.2019.02.006>
- Oliveira, D., Bosco, A., & di Lorito, C. (2019). Is poor health literacy a risk factor for dementia in older adults? Systematic literature review of prospective cohort studies. In *Maturitas* (Vol. 124, pp. 8–14). Elsevier Ireland Ltd. <https://doi.org/10.1016/j.maturitas.2019.03.010>
- Prince, M. J., Wu, F., Guo, Y., Gutierrez Robledo, L. M., O’Donnell, M., Sullivan, R., & Yusuf, S. (2015). The burden of disease in older people and implications for health policy and practice. In *The Lancet* (Vol. 385, Issue 9967, pp. 549–562). Lancet Publishing Group. [https://doi.org/10.1016/S0140-6736\(14\)61347-7](https://doi.org/10.1016/S0140-6736(14)61347-7)
- Qin, L., & Xu, H. (2016). A cross-sectional study of the effect of health literacy on diabetes prevention and control among elderly individuals with prediabetes in rural China. *BMJ Open*, 6(5), e011077. <https://doi.org/10.1136/bmjopen-2016-011077>
- Shamseer, L., Moher, D., Clarke, M., Ghersi, D., Liberati, A., Petticrew, M., Shekelle, P., Stewart, L. A., & Group, P.-P. (n.d.). *Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015: elaboration and explanation OPEN ACCESS*. <https://doi.org/10.1136/bmj.g7647>
- Simon, M. A., Li, Y., & Dong, X. (2014). Levels of health literacy in a community-dwelling population of Chinese older adults. *The Journals of Gerontology. Series A, Biological Sciences and Medical Sciences*, 69 Suppl 2, S54-60. <https://doi.org/10.1093/gerona/glu179>
- Tiller, D., Herzog, B., Kluttig, A., & Haerting, J. (2015a). Health literacy in an urban elderly East-German population - Results from the population-based CARLA study. *BMC Public Health*, 15(1), 883. <https://doi.org/10.1186/s12889-015-2210-7>
- Tiller, D., Herzog, B., Kluttig, A., & Haerting, J. (2015b). Health literacy in an urban elderly East-German population - Results from the population-based CARLA study. *BMC Public Health*, 15(1). <https://doi.org/10.1186/s12889-015-2210-7>

- Todorovic, N., Jovic-Vranes, A., Djikanovic, B., Pilipovic-Broceta, N., Vasiljevic, N., & Racic, M. (2019). Health literacy: Current status and challenges in the work of family doctors in Bosnia and Herzegovina. *International Journal of Environmental Research and Public Health*, 16(8). <https://doi.org/10.3390/ijerph16081324>
- Wang, Q., Zhou, Y., Ding, X., & Ying, X. (2017). Demand for Long-Term Care Insurance in China. *International Journal of Environmental Research and Public Health*, 15(1), 6. <https://doi.org/10.3390/ijerph15010006>
- Wenjuan, G., Siqing, P., & Xinqiao, L. (2019). *Gender differences in depression, anxiety, and stress among college students: A longitudinal study from China*. <https://doi.org/10.1016/j.jad.2019.11.121>
- WHO. (2015). *China country assessment report on ageing and health*.
- WHO | The WHO Health Promotion Glossary. (2019). *WHO*.
- Wolf, M. S., Feinglass, J., Thompson, J., & Baker, D. W. (2010). In search of “low health literacy”: Threshold vs. gradient effect of literacy on health status and mortality. *Social Science and Medicine*, 70(9), 1335–1341. <https://doi.org/10.1016/j.socscimed.2009.12.013>
- Wolf, M. S., Gazmararian, J. A., & Baker, D. W. (n.d.). *Health Literacy and Functional Health Status Among Older Adults*. <https://jamanetwork.com/>
- Xie, Y., Ma, M., Zhang, Y., & Tan, X. (2019). Factors associated with health literacy in rural areas of Central China: structural equation model. *BMC Health Services Research*, 19(1), 300. <https://doi.org/10.1186/s12913-019-4094-1>
- Yang, Y., Zhang, B., Meng, H., Liu, D., & Sun, M. (2019). Mediating effect of social support on the associations between health literacy, productive aging, and self-rated health among elderly Chinese adults in a newly urbanized community. *Medicine*, 98(16), e15162. <https://doi.org/10.1097/MD.00000000000015162>