

# Investigation of Health Literacy Status in Beijing, China

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## ABSTRACT

**Background:** The Chinese government uses health literacy as an evaluation to estimate population health status in national strategic planning. A health literacy survey system for the city of Beijing, China was established in 2012 with triennial surveys to obtain representative data for the whole city. **Objective:** The objective of this study was to examine results of the 2015 Beijing Health Literacy Survey and to identify population subgroups that may warrant intervention due to high risk for not having adequate health literacy. **Methods:** This was a cross-sectional study in which participants were selected by multistage stratified cluster sampling. The information was collected in 2015 in face-to-face interviews on the Chinese Citizen Health Literacy Questionnaire. A total of 12,876 interviews were included in the final analyses. Weighting was conducted in all statistical analyses to obtain representative estimates, and multiple logistic regression was applied to examine the independent influencing factors on health literacy level (adequate/inadequate). **Key Results:** Overall, 28% of participants had adequate health literacy. Urban residents had a higher proportion of participants with adequate health literacy compared to rural residents (29.5% vs. 19%,  $p < .01$ ). Women (29.7%) had a higher proportion of participants with adequate health literacy compared to men (29.7% vs. 26.4%,  $p < .01$ ). The proportion of participants with adequate health literacy was significantly different among age groups ( $\chi^2 = 332.9$ ,  $p < .01$ ). Residents age 25 to 34 years had the highest rate of adequate health literacy (33.9%). The proportion of participants with adequate health literacy increased as participants obtained more education ( $\chi^2 = 818.4$ ,  $p < .01$ ). Residents in households with higher income had a higher rate of adequate health literacy ( $\chi^2 = 462.4$ ,  $p < .01$ ). Gender, age, education, and household income were independently associated with the level of health literacy. **Conclusions:** Substantial variation exists in health literacy level among age groups, gender groups, and education groups. Taking these disparities into account is important when developing health policies and allocating resources. [*HLRP: Health Literacy Research and Practice*. 2020;4(3):e174-e184.]

**Plain Language Summary:** The results of this investigation revealed the health literacy status of residents in Beijing, China, and the high-risk population that may be more likely to have low health literacy. Targeted health education interventions may be helpful to improve health literacy.

Health literacy is the degree to which a person has the capacity to obtain, understand, communicate, and apply basic health information to improve one's health (Nutbeam D., 2008). Health literacy has received growing attention since the year 2000 when the World Health Organization (WHO) stated that improving public health literacy is an important public health concern, and that improving health literacy can reduce inequities in health services and social cost (Ratzan & Parker, 2000).

Health literacy is an important factor for health and can be seen as the comprehensive reflection of economic and social development. It can be affected and limited by politics, economy, education, and culture (Yao et al., 2016). Many reports have suggested that low health literacy is associated with poor health outcomes, including poor health status (Jayasinghe et al., 2016), lack of knowledge about medical conditions and related care (Song et al., 2012), lack of engagement with health

care providers (Easton et al., 2013), low use of preventive health services (Easton et al., 2013; Jayasinghe et al., 2016), decreased comprehension of medical information (Song et al., 2012), and higher mortality (Berkman et al., 2011). The WHO demonstrated that health literacy is a feasible scientific indicator to estimate population health status (World Health Organization Regional Office for Europe, 2013). Therefore, the WHO has suggested that enhancing public health literacy is an important strategy to improve the overall health status of a population. In China, health literacy was included as an evaluation indicator for healthy living in “Healthy China 2030” strategic planning (The State Council of China, 2016).

## BACKGROUND

In 2008, China conducted its first survey of the health literacy status in the nation (Yao et al., 2016). In 2012, the Ministry of Finance established a project to promote health literacy (Li et al., 2015). After that, health literacy monitoring became a routine task in China. The level of citizens’ health literacy was introduced into the “Twelfth Five-year (2011-2015) Plan for the National Basic Public Service System Construction” and the “Twelfth Five-year (2011-2015) Plan for Health Care Development” as a measure to judge the degree of national basic public service and people’s health status in the same year (The State Council of China, 2012), which played a positive role in promoting health literacy for all. The National Health Commission of China issued a new strategic plan on the promotion of health literacy for Chinese citizens (2014-2020) in 2014 with a goal of increasing adequate health literacy to 20% of the population by 2020 (National Health Commission of China, 2014), as it was only 8.8% in 2012. The goal for Beijing residents, which was set by the Beijing Municipal Government (2017), was even higher at 40%.

A health literacy survey system for Beijing was established in 2012 with triennial surveys to obtain representa-

tive data for the whole city. The data from 2012 estimated that the percentage of residents with adequate health literacy was 24.7% (Shi et al., 2015), far behind the 2020 goal of 40%.

We conducted the health literacy monitoring survey in Beijing for the second time in 2015. The objective of this study was to examine results of the 2015 Beijing Health Literacy Survey (Liu, 2018) and to identify population subgroups that may warrant intervention due to risk factors for not having adequate health literacy. These findings may provide scientific evidence to support future policies to improve health literacy.

## METHODS

### Study Population

The participants enrolled in this survey were selected based on the following criteria: (1) inclusion criteria: (a) between ages 15 and 69 years, (b) had lived in Beijing (household registration was not taken in to consideration) for more than 6 months in the past year; and (2) exclusion criteria: (a) residents who lived in collective dwellings such as military bases, hospitals, nursing homes, college dormitories, (b) people diagnosed with mental disorders, cognitive disorders, or severe and end-stage disease.

The investigation was approved by the ethics committee of the Beijing Center for Disease Control and Prevention, and informed consent forms were obtained from each participant before data collection. The information was collected in face-to-face interviews on Chinese Citizen Health Literacy Questionnaires. All investigators participated in provincial training courses and were qualified to engage in field activities after passing standard examinations.

Multistage stratified cluster sampling was used to select participants (Jing et al., 2008). In the first stage of sampling, a total of 100 communities or townships were randomly sampled from each district/county (16 in total) using the method of probability proportional to size. Then, three resi-

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dential communities or administrative villages were selected from each chosen community or township using the same method as in the previous stage. Subsequently, in each residential community or administrative village, a residential group (at least 60 families) was sampled by simple random sampling. Finally, a person of at least age 15 years was chosen in each family by means of a Kish grid. About 8% of the sampled families could not be located after three attempts, so these households were replaced by others with similar family structures. There were 13,577 interviews conducted, and a total of 12,876 interviews were included in the final analyses.

### Health Literacy Assessment

The Chinese Citizen Health Literacy Questionnaire (Nie et al., 2014), which was developed by the China National Center for Health Education, was used in this study. The questionnaire was designed according to “Basic Knowledge and Skills of Health Literacy Definition for Chinese Citizens,” a handbook formally defining 66 items of basic knowledge and skills associated with Chinese citizens’ health literacy published by the National Health Commission of China in 2008 (Selvin, 1996). The questionnaire covers three categories (basic health knowledge and concepts, healthy lifestyle and behavior, and health skills literacy) and seven subcategories (scientific health concept, obtaining and making use of health information, daily health behavior, knowledge of safety and first aid, knowledge of preventing infectious diseases, knowledge of preventing noncommunicable chronic disease, and primary medical care) (Table 1).

This questionnaire contains 80 items with a total of 100 points. This questionnaire demonstrated high internal consistency reliability with a Cronbach’s alpha of .931. The Cronbach’s alpha of basic health knowledge and concepts, healthy lifestyle and behavior, and health skills literacy is .871, .774, and .802 respectively (Nie et al., 2014).

The questionnaire included different types of questions: true/false, multiple-choice type A (only one correct answer), and multiple-choice type B (more than one correct answer). For true/false and multiple-choice type A questions, incorrect answers received 0 points and correct answers received 1 point. For multiple-choice type B questions, incorrect responses received 0 points and correct responses received 2 points. If a participant responded as “do not know,” it was considered incorrect. The total score for health literacy was calculated by summing the scores of questions from the three categories with equal weighting. Participants who received 80 points or higher were considered to have adequate health literacy.

### Other Covariates of Interest

Demographic characteristics, including gender, age, race, education, occupation, family size, residence location, and household income, were also collected in the questionnaire. Age was divided into six groups: 15 to 24 years, 25 to 34 years, 35 to 44 years, 45 to 54 years, 55 to 64 years, and 65 to 69 years. Education level was categorized in five groups: primary school or below, junior high school, senior high school/technical secondary school, college graduate, and postgraduate or above. Household income was divided into four groups: less than 30,000 yuan (\$4,317) per year, 30,000 to 50,000 yuan (\$4,317 to \$7,195) yuan per year, 50,000 to 100,000 thousand yuan (\$7,195 \$14,390) per year, and more than 100,000 yuan (\$14,391) per year.

### Statistical Analysis

A database was established using EpiData 3.1. To control for selection bias introduced by sampling procedures, the dataset was weighted based on the 2010 Chinese population census obtained from the National Bureau of Statistics of China. Weighting criteria were age, gender, and rural/urban residence. We first determined the sample characteristics and then estimated the percent of adequate health literacy (for the three categories, seven subcategories, and total health literacy) on the basis of specific covariates including gender, age, rural/urban residence, education, and household income. We calculated 95% confidence intervals (CI) for the estimated percentages and determined differences using a chi-squared test. We also examined the covariates associated with having adequate healthy literacy using multivariable logistic regression to calculate the odd ratio (OR) and 95% CIs using gender, age, rural/urban residence, education, and household income as predictors. All statistical analysis was performed using SPSS Statistics 20.

## RESULTS

### Population Characteristics

The characteristics of the study population are shown in Table 2. A large proportion of the participants (86.6%) lived in urban areas, and there were more women than men (53.5% vs. 46.5%). The average age of the participants was  $46.5 \pm 13.4$  years. Approximately one-third of participants (34.4%) were college graduates and 28.5% had completed senior high school/technical secondary school. Participants with a household income of 5,000 to 10,000 yuan (\$719 to \$1,439) per year were the largest income group (34.1%).

TABLE 1

The Evaluation Framework of Health Literacy Level in the Chinese Health Literacy Survey

Category	Subcategory						
	Scientific health concept	Literacy of obtaining and making use of health information	Daily health behavior	Knowledge of safety and first aid	Knowledge of preventing infectious diseases	Knowledge of preventing noncommunicable chronic disease	Primary medical care
Basic health knowledge and concepts	Knowledge of health concepts Attitude toward health issues	-	Knowledge on physical hygiene Health care and recovery	Environmental and occupational safety Regulations and policies relating to health rights	Knowledge on prevention of infectious disease	Knowledge on prevention of noncommunicable chronic disease	-
Healthy lifestyle and behavior	Mental adjustment	-	Personal hygiene Sports Nutrition and diet	-	-	-	Ability to apply or use the essential public health service Health-seeking behavior
Health skills literacy	-	Ability to access information on health issues Ability to understand information relevant to health	The ability of self-care	Ability to do basic first aid	-	-	-

### Adequate Health Literacy by Demographic Factors

Overall, 28% respondents had adequate health literacy (Table 3). Urban residents had a higher proportion of adequate health literacy (29.5%) compared to rural residents (19%). More women had adequate health literacy (29.7%) compared to men (26.4%). Residents in the age group of 25 to 34 years had the highest rate of adequate health literacy (33.9%), followed by the age group of 35 to 44 years (30.9%), and the proportion of participants with adequate health literacy increased as participants obtained more education. Residents in higher household income groups had a higher rate of adequate health literacy. The proportion of adequate health literacy was significantly different among urban versus rural groups ( $\chi^2=32.05, p<.01$ ), gender groups ( $\chi^2=9.7, p<.01$ ), age groups ( $\chi^2=332.9, p<.01$ ), education groups ( $\chi^2=818.4, p<.01$ ), and household income groups ( $\chi^2=462.4, p<.01$ ).

### Distribution of the Three Categories of Health Literacy

The distribution of the demographic characteristics by the three categories of adequate health literacy are also shown in Table 3. A total of 33.7% of urban residents had adequate basic health knowledge, 26% had adequate healthy lifestyle and behavior literacy, and 40.9% had adequate health skills literacy, compared with 21.9%, 17.2%, and 28.3% for rural residents, respectively. More women had adequate health literacy in the three categories than men (32.8%, 25.8%, 41.5% vs. 31.4%, 23.9%, 37%). The highest rates of adequate health literacy in three dimensions (36.8%, 30.4%, 43.9%) were all observed in residents in the 25- to 34-year-old age group, and the proportion of participants with adequate health literacy in three categories increased as participants obtained more education.

TABLE 2

### Characteristics of the Study Sample of the 2015 Residents' Health Literacy Status Survey in Beijing, China

Characteristic	Respondents (N = 12,876)		
	Number	%	Weighted <sup>a</sup> %
Place of residence			
Urban	11,157	11,157	86.1
Rural	1,719	1,719	13.9
Gender			
Male	5,992	46.5	51.8
Female	6,884	53.5	48.2
Age group (years)			
15-24	665	5.2	22.1
25-34	2,300	17.9	25.1
35-44	2,510	19.5	20.2
45-54	3,097	24.1	17.8
55-64	3,246	25.2	11.7
65-69	1,058	8.2	3.1
Education			
Primary school or below	1,027	8	7.5
Junior high school	3,376	26.2	32.9
Senior high school/TSS	3,669	28.5	24
College graduate	4,428	34.4	33
Postgraduate or above	376	2.9	2.6
Household income (10,000 yuan [\$1,439] per year)			
<30,000	2,772	21.5	22.6
30,000-49,999	2,133	16.6	17.9
50,000-99,999	4,389	34.1	32.7
≥100,000	3,582	27.8	26.8

Note. <sup>a</sup>Standardized weights were used to obtain municipal representative estimates. TSS = technical secondary school.

#### Distribution of the Seven Subcategories of Health Literacy

The distribution of adequate health literacy in the seven subcategories was determined. The results were as follows (**Table 4**): scientific health concept (69.2%), obtaining and making use of health information (31.8%), daily care (11.7%), safety and first aid (68%), preventing infectious disease (46.4%), preventing noncommunicable chronic disease (32.9%), and primary medical care (34.5%). Urban residents had a higher rate of adequate health literacy than rural residents: scientific health concept (71% vs. 58.3%), obtaining and making use of health information (33.1%

vs. 24.1%), daily care (12.1% vs. 8.7%), safety and first aid (69.4% vs. 59.6%), preventing infectious disease (47.6% vs. 38.5%), preventing noncommunicable chronic disease (33.8% vs. 27.3%), and primary medical care (35.6% vs. 27.7%). Residents younger than age 45 years were more likely to have adequate health literacy in all seven subcategories than those age 45 to 69 years. Participants who were well educated were likely to have higher health literacy.

#### Factors Associated with Level of Health Literacy

In a multivariable logistic regression model for adequate health literacy, gender, age, education, and household in-

TABLE 3

### Weighted Percentage of Participants with Adequate Health Literacy Overall by the Three Categories in Beijing Residents Age 15 to 69 Years in 2015

Characteristic	Health literacy overall, % (95% CI)	Basic health knowledge and concepts, % (95% CI)	Healthy lifestyle and behavior, % (95% CI)	Health skills literacy, % (95% CI)
Place of residence				
Urban	29.5 [28.2, 30.7]	33.7 [32.4, 35]	26 [24.8, 27.2]	40.9 [39.6, 42.3]
Rural	19 [16, 21.9]	21.9 [18.8, 24.9]	17.2 [14.5, 20]	28.3 [24.7, 32]
Gender				
Male	26.4 [24.7, 28]	31.4 [29.6, 33.2]	23.9 [22.3, 25.5]	37 [35.1, 38.8]
Female	29.7 [28.2, 31.3]	32.8 [31.2, 34.4]	25.8 [24.3, 27.3]	41.5 [39.8, 43.3]
Age group (years)				
15-24	26.9 [23.1, 30.7]	31.5 [27.5, 35.5]	22.8 [19.2, 26.5]	39.5 [35.1, 43.8]
25-34	33.9 [31.7, 36.2]	36.8 [34.5, 39.1]	30.4 [28.2, 32.6]	43.9 [41.5, 46.4]
35-44	30.9 [28.8, 33]	34.9 [32.7, 37.1]	27.1 [25.1, 29.1]	42 [39.7, 44.4]
45-54	22.7 [21.2, 24.1]	27.1 [25.6, 28.7]	21 [19.5, 22.4]	34.7 [32.9, 36.4]
55-64	21.8 [20.3, 23.3]	26.3 [24.7, 27.9]	19.6 [18.2, 21.1]	32.6 [30.9, 34.3]
65-69	21.9 [20.3, 23.6]	27.8 [26.0, 29.6]	19.6 [18.0, 21.2]	31.9 [30.2, 33.6]
Education				
Primary school or below	13.9 [9.5, 18.4]	8.3 [3.5, 23]	11.7 [7.9, 15.6]	20.8 [15.3, 26.4]
Junior high school	17.5 [15.4, 19.6]	20.4 [18.1, 22.6]	16 [13.9, 18.1]	27.5 [25, 30]
Senior high school/TSS	26.3 [24.4, 28.2]	30.6 [28.6, 32.6]	24.3 [22.5, 26.2]	41.1 [39, 43.2]
Graduate	41.1 [39.2, 43]	46.2 [44.2, 48.1]	35.4 [33.5, 37.2]	52 [50, 53.9]
Postgraduate or above	51.1 [45.4, 56.9]	54.3 [48.5, 60.1]	44 [38.3, 49.6]	59.1 [53.3, 64.8]
Household income (10,000 yuan [\$1,439] per year)				
<30,000	16.9 [14.7, 19.1]	20.7 [18.4, 23.1]	15.4 [13.2, 17.7]	27.2 [24.4, 30]
30,000-49,999	22.4 [19.6, 25.1]	25.4 [22.7, 28.2]	19.4 [17, 21.8]	33.9 [30.9, 36.8]
50,000-99,999	30.7 [28.7, 32.8]	35 [32.8, 37.1]	26.6 [24.7, 28.6]	42.6 [40.3, 44.8]
≥100,000	37.8 [35.6, 40]	42.5 [40.2, 44.8]	34 [31.9, 36.1]	48.7 [46.3, 51.1]
Total	28 [26.9, 29.1]	32.1 [30.9, 33.3]	24.8 [23.7, 25.9]	39.2 [37.9, 40.5]

Note. CI = confidence interval; TSS = technical secondary school.

come were found to be independently associated with adequate health literacy (**Table 5**). Women were 1.14 times more likely to have adequate health literacy than men. In the 25- to 34-year-old age group and the 35- to 44-year-old age group, the odds of adequate health literacy were 1.31 times and 1.35 times higher, respectively, than those in the 15- to 24-year-old age group. The OR increased with increasing educational levels as well as increasing household income. People who completed junior high school or above were 1.39 to 4.18 times more likely to have adequate health literacy than those with a primary school education or less. The difference between urban and rural residents was not statistically significant after adjustment for the other factors.

## DISCUSSION

In this study, the percentage of Beijing residents with adequate health literacy was 28% (95% CI [26.9%, 29.1%]), which is 3.3% higher compared to the level in 2012 (24.7%, 95% CI [23.8%, 25.7%]) (Shi et al., 2015). The proportions of participants with adequate health literacy in the three categories (basic health knowledge and concepts, healthy lifestyle and behavior, and health skills literacy) were 32.1%, 24.8%, and 39.2%, respectively. The proportion of residents with adequate literacy in each of the three dimensions increased compared to the 2012 estimates of 30.3%, 18.8%, and 35.1%, respectively. The government had done much work, such as health education activities and creating supportive environments, to improve residents' health literacy. The Beijing Municipal Government published plans to improve the health of residents in Beijing in 2009 and 2010 by providing policy support for health promotion (Beijing Municipal Government, 2009; Beijing Municipal Government, 2010). Since then, the Beijing television station has started to offer more health-related television programs, such as "To Be a Doctor Myself," which is a television show explaining the science of health maintenance using traditional Chinese medicine. These shows are popular among residents in Beijing, particularly senior citizens. In addition, the Institutes of Health Education implemented activities like "Healthy Big Classroom" and spread health knowledge through new media such as mobile apps to make more people aware of basic health skills. Furthermore, general health knowledge lectures were held by community health care centers, helping people recognize their health problems and answering common questions of concern to the residents. As this is a cross-sectional survey, whether these activities played an important role on improving health literacy cannot be determined.

Although the proportion of residents with adequate health literacy in Beijing was higher than the average in China (Li, 2014; Yao et al., 2016;), it was still a low level. Nevertheless, low health literacy levels are common, even in economically advanced countries with strong education systems (World Health Organization Regional Office for Europe, 2013). Most research and practice related to health literacy has been conducted in the United States and select countries in Europe. For example, they have conducted several national health literacy surveys and have formulated standard health literacy evaluation systems (Sørensen et al., 2015; Kutner et al., 2006). Nevertheless, health literacy deficits remain a serious problem in developed countries. Low health literacy has been a global public health problem. According to research from the United States Department of Education, only 12% of English-speaking adults in the United States have proficient health literacy skills (U.S. Department of Health and Human Services & Office of Disease Prevention and Health Promotion, 2010). The Adult Literacy and Life Skills Survey in Australia found 60% of adults to be performing at a low level of health literacy, but other data show that 41% of Australians age 15 to 74 years had adequate health literacy or above (Australian Institute of Health and Welfare, 2012).

In this study, the demographics associated with health literacy included gender, age, education, and family income after mutual adjustment. Multiple factor analysis showed that women were 1.14 times more likely to have adequate health literacy than men. In most Chinese families, women (especially mothers) play an important role in family life. They do the housework and take care of children and elders, so they know more about the family members' health status and are more likely to obtain health knowledge actively. Women who have a higher health literacy may help increase their families' health status and health literacy level.

Univariate analysis suggested a difference in adequate health literacy by urban or rural residence, but after adjustment for other demographic factors, this association was no longer detected. The possible reason for this is that urban residents had higher education level than people in rural areas, and education level is more strongly associated with health literacy.

Among participants age 15 to 69 years, those in the 25- to 34-year-old and 35- to 44-year-old age groups had the highest education level. Adults age 25 to 44 years have a strong ability to learn new things and acquire new knowledge. They can understand health information from various media more easily than older or younger people. On the contrary, elderly people in this study tended to have completed fewer years of schooling than adults in the younger age groups. They may

TABLE 4

### Weighted Percentage of Participants with Adequate Health Literacy by the Seven Subcategories in Beijing Residents Age 15 to 69 Years in 2015

Characteristic	Scientific health concept, % (95% CI)	Obtaining and making use of health information, % (95% CI)	Daily health behavior, % (95% CI)	Safety and first aid, % (95% CI)	Preventing infectious diseases, % (95% CI)	Preventing non-communicable disease, % (95% CI)	Primary medical care, % (95% CI)
Place of residence							
Urban	71 [69.6, 72.3]	33.1 [31.8, 34.4]	12.1 [11.3, 13]	69.4 [68, 70.7]	47.6 [46.2, 49.1]	33.8 [32.5, 35.1]	35.6 [34.3, 36.9]
Rural	58.3 [54.2, 62.5]	24.1 [20.5, 27.7]	8.7 [6.4, 10.9]	59.6 [55.4, 63.7]	38.5 [34.6, 42.4]	27.3 [23.6, 30.9]	27.7 [23.8, 31.6]
Gender							
Male	68.7 [66.8, 70.7]	30.5 [28.7, 32.2]	11.2 [10, 12.4]	66.2 [64.2, 68.2]	45.9 [43.9, 47.8]	32.1 [30.3, 33.9]	33 [31.1, 34.8]
Female	69.7 [68, 71.4]	33.3 [31.6, 35]	12.2 [11.1, 13.2]	70 [68.3, 71.6]	46.9 [45.1, 48.7]	33.7 [32.1, 35.3]	36.2 [34.5, 37.9]
Age group (years)							
15-24	70.2 [65.8, 74.6]	35.1 [30.8, 39.4]	9.5 [6.8, 12.1]	68.4 [63.9, 72.9]	44.9 [40.4, 49.4]	33.9 [29.7, 38]	33.8 [29.6, 38.1]
25-34	72.8 [70.4, 75.2]	34.9 [32.6, 37.2]	14 [12.5, 15.6]	71.8 [69.3, 74.2]	51.8 [49.3, 54.3]	37.2 [34.9, 39.5]	38.8 [36.4, 41.2]
35-44	71.6 [69.3, 73.9]	33.6 [31.4, 35.8]	13.1 [11.6, 14.5]	71.1 [68.8, 73.3]	50.2 [47.8, 52.6]	35.0 [32.8, 37.2]	37.3 [35.1, 39.6]
45-54	64.5 [62.7, 66.2]	27.4 [25.8, 29]	10.4 [9.3, 11.5]	64.2 [62.5, 65.9]	40.8 [39, 42.6]	27.1 [25.5, 28.6]	30.2 [28.6, 31.9]
55-64	63.3 [61.5, 65.1]	24.4 [22.8, 25.9]	10.6 [9.5, 11.7]	61.1 [59.3, 62.9]	40.0 [38.2, 41.8]	27.5 [25.9, 29.2]	29.3 [27.7, 31]
65-69	66.9 [63.9, 70]	25.4 [22.6, 28.2]	9.6 [7.7, 11.4]	63.2 [60.1, 66.3]	44.3 [41.1, 47.5]	30.2 [27.2, 33.1]	30.7 [27.7, 33.6]
Education							
Primary school or below	49.6 [43.8, 55.5]	16.2 [11, 21.4]	6.3 [3.6, 9.1]	43.1 [37.4, 48.7]	32.6 [26.9, 38.3]	18.1 [12.8, 23.4]	19 [13.8, 24.3]
Junior high school	59.9 [57, 62.7]	22 [19.6, 24.5]	8.4 [6.7, 10]	61.3 [58.5, 64.1]	37.3 [34.5, 40.1]	21.8 [19.6, 24.1]	27.4 [24.8, 30]
Senior high school/TSS	69.7 [67.7, 71.7]	33.3 [31.2, 35.4]	11 [9.7, 12.3]	69.6 [67.6, 71.6]	46.3 [44.1, 48.5]	33.2 [31.1, 35.2]	35.2 [33.2, 37.3]
Graduate	81.6 [80, 83.1]	42.6 [40.7, 44.5]	15.8 [14.5, 17.1]	78.1 [76.4, 79.8]	57.3 [55.4, 59.2]	45.2 [43.2, 47.1]	43.5 [41.6, 45.5]
Postgraduate or above	82.5 [78.0, 87]	50.3 [44.5, 56]	22.5 [17.9, 27.1]	82.2 [77.7, 86.7]	62.5 [56.8, 68.2]	56.1 [50.4, 61.9]	48.5 [42.7, 54.2]
Total	69.2 [67.9, 70.5]	31.8 [30.6, 33]	11.7 [10.9, 12.5]	68.0 [66.7, 69.3]	46.4 [45, 47.7]	32.9 [31.7, 34.1]	34.5 [33.3, 35.8]

Note: Weighting was taken into account for percentages and 95% CIs. CI = confidence interval; TSS = technical secondary school.

TABLE 5

**Multivariable Logistic Regression Analysis for Adequacy of Health Literacy in Beijing Residents in 2015**

Characteristic	$\beta$	SE	OR <sup>a</sup> [95% CI <sup>b</sup> ]	p value
Place of residence				
Urban	0.11	0.06	1.11 [0.98,1.26]	.09
Rural	0	–	1	–
Gender				
Male	0	–	1	–
Female	0.13	0.04	1.14 [1.05,1.23]	<.01
Age group (years)				
15-24	0	–	1	–
25-34	0.27	0.10	1.31 [1.08,1.58]	<.01
35-44	0.30	0.10	1.35 [1.12,1.64]	<.01
45-54	-0.03	0.10	0.97 [0.80,1.18]	.75
55-64	0.05	0.10	1.05 [0.86,1.27]	.64
65-69	0.17	0.12	1.19 [0.94,1.49]	.15
Education				
Primary school or below	0	–	1	–
Junior high school	0.33	0.11	1.39 [1.13,1.71]	<.01
Senior high school/TSS	0.70	0.11	2.01 [1.63,2.47]	<.01
Graduate	1.23	0.11	3.43 [2.78,4.24]	<.01
Postgraduate or above	1.57	0.15	4.81 [3.59,6.46]	<.01
Household income [10,000 yuan [\$1,439] per year)				
<30,000	0	–	1	–
30,000-49,999	0.18	0.07	1.20 [1.04,1.39]	.014
50,000-99,999	0.47	0.06	1.60 [1.41,1.81]	<.01
≥100,000	0.62	0.07	1.86 [1.63,2.12]	<.01

Note. <sup>a</sup>Odds ratio from a binary logit model with adjustment for all covariates. Health literacy level [adequate/inadequate] was the dependent variable. Each odds ratio reflects the cumulative odds of rating adequate health literacy versus inadequate against the cumulative odds in the reference group. <sup>b</sup>The 95% confidence intervals take into account the standardized weights. CI = confidence intervals; OR = odds ratio; SE = standard error; TSS = technical secondary school.

have difficulty learning new health knowledge due to their low education and deterioration of the memory. People who are well educated generally have rich reserves of knowledge. They have a strong capacity to obtain and understand health information and can use it in their daily life. They also have greater learning capabilities than people at low education levels. For this reason, people with higher education levels have higher health literacy; however, inadequate health literacy affects people of all ages and educational levels. In particular, it affects people of low socioeconomic status. We need to focus on these specific population groups and carry out targeted health education programs to improve their health literacy. We can also know the risk factors from the

dimensions and subcategories, and this can guide the direction of health interventions.

People with limited health literacy have an inadequate ability to access and use health information or engage in healthy behaviors, and they are more likely to have worse health outcomes (Liu et al., 2015; Wang et al., 2015). Overall, health literacy is influenced by many factors, and improving health literacy will require the whole society to make efforts, rather than just the health ministry. In recent years, multi-sectoral collaboration has become a method for management of public health as well as noncommunicable disease control and prevention. The Chinese government and its member sections should

promote the “Health for All” policy (World Health Organization, 2014) implementation for health education and improve multi-sector collaboration. China is aiming to have high levels of adequate health literacy, but there is still a long way to go.

## STUDY LIMITATIONS

The strengths of the study include a relatively large sample size of 13,577 residents surveyed and the high response rate (94.84%). However, several limitations in this study should be noted. The cross-sectional design does not allow for any inferences on causality. Secondly, the age of participants only went to 69 years. It is possible that people older than age 69 years may have low health literacy and this could have inflated the rate of Beijing residents’ adequate health literacy. Patients with cognitive disorders and severe disease were not included because they were unable to finish the questionnaire. Third, although the questionnaire we used to measure health literacy was comprehensive, comparisons of health literacy status with those of other countries are difficult because of different reference standards for health literacy. However, this cross-sectional survey provided important evidence and identified several factors associated with adequate health literacy in a population in China.

## CONCLUSION

The general health literacy of the residents in Beijing, China, was low. Substantial variation existed in health literacy level by numerous demographic factors. Taking these differences into account could be important for tailoring health education and promoting interventions to improve health literacy overall, developing health policy, and allocating resources.

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