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Health Literacy in Taiwan: A Population-Based Study

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Abstract

Data on health literacy (HL) in the population is limited for Asian countries. This study aimed to test the validity of the Mandarin version of the European Health Literacy Survey Questionnaire (HLS-EU-Q) for use in the general public in Taiwan. Multistage stratification random sampling resulted in a sample of 2989 people aged 15 years and above. The HLS-EU-Q was validated by confirmatory factor analysis with excellent model data fit indices. The general HL of the Taiwanese population was 34.4 ± 6.6 on a scale of 50. Multivariate regression analysis showed that higher general HL is significantly associated with the higher ability to pay for medication, higher self-perceived social status, higher frequency of watching health-related TV, and community involvement but associated with younger age. HL is also associated with health status, health behaviors, and health care accessibility and use. The HLS-EU-Q was found to be a useful tool to assess HL and its associated factors in the general population.

Keywords

health literacy, HLS-EU-Qs, Taiwan, age, health-related TV

Introduction

Health literacy (HL) has previously been characterized as the ability to read and understand health information in clinical practice, but over the years its meaning has expanded to involve a much wider scope of abilities related to taking control of and making decisions regarding health.[1] It reflects the ability to read and understand health information, engage with the health care process, and remove unnecessary complexity and barriers to understanding health events and involvements.[2] More recently, the concept has been further developed to entail the knowledge,

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motivation, and competences to access, understand, appraise, and apply information in everyday life to make judgments and decisions in terms of health care, disease prevention, and health promotion as well as to maintain and promote quality of life throughout the life course.[3] HL is recognized as an important determinant of health, in the sense that better HL has been shown to enable better self-care with fewer health risks, better health care outcomes, and lower health costs.[4,5] In contrast, low HL has been shown to be a potential health risk factor[1] and to be associated with poor health outcomes.[6]

Studies in Canada,[7] the United States,[8,9] Europe,[10] and China[11] have demonstrated that HL is influenced by age, education, and income as well as self-perceived social status.[2,12] On the other hand, health-related activities and programs in communities and workplaces have been demonstrated to improve HL and health outcomes.[7] Even relatively "general" interventions such as watching health promoting television series can enhance HL, as shown in studies carried out in Poland, Bangladesh, and the United States.[13-15]

To understand the HL status of individuals, a range of assessment tools have been developed. Some of these tools have been used in Asia, with patients in different languages, and adapted to different cultures.[16] However, instruments to measure the level of HL among the general public and to make comparisons between countries, as has been done in the European Health Literacy Survey (HLS-EU),[10] have thus far not been available for Asia. Recently, the questionnaire used for the European Health Literacy Survey was validated and used in Japan,[17] enabling comparison of the level of HL in the Japanese population with that of 8 European countries. The present study aimed to further validate the HLS-EU questionnaire for use in Taiwan, measure the level of HL in the general Taiwanese population, and identify key personal and sociodemographic factors that are associated with HL.

Methods

Study Design and Sampling

A cross-sectional survey was conducted in Taiwan using the European Health Literacy Survey Questionnaire (HLS-EU-Q), from February to October 2013. The nationwide survey was conducted on a randomly selected sample of residents aged 15 years and older, similar to sample selection criteria in the EUROBAROMETER samples, which had been restricted to EU citizens with a minimum age of 15 years.[18] Multistage stratified random sampling was used in 4 regions in Taiwan (north, center, east, and south), then by cities (17 cities and counties included); participants were invited in each city and county to participate in the survey at communities, schools, or workplaces. Potential participants were identified through the national administrative registration system, which included all registered citizens in Taiwan with their residency and personal identification.

Questionnaires and Measures

HL was measured by the HLS-EU-Q developed by the HLS-EU project consortium. The HLS-EU-Q is based on a conceptual model of HL, which identifies 4 competences related to managing health information (access/obtain, understand, appraise/judge/evaluate, and apply/use health information) in 3 domains (health care, disease prevention, and health promotion).[4] The questionnaire consists of 47 items representing competences to access, understand, appraise, and apply information, the perceived difficulty of which must be rated on 4-point Likert scales (1 = *very difficult*, 2 = *difficult*, 3 = *easy*, and 4 = *very easy*). This allows the calculation of a general HL (GHL) index, comprising the scores on all items and providing a general assessment of the respondents' HL.[18]

With the agreement of the HLS-EU consortium, the 47 items of the HLS-EU-Q were translated into traditional Mandarin using the translation–back-translation method. The content of the questionnaire was verified by a panel of public health experts in Taiwan, who took the cultural aspects into account. The questionnaire was then pretested for readability and understandability by experienced survey scientists.

Health status was measured via self-report. Participants were asked to rate their overall health status using a 5-point Likert scale ranging from *poor* (1) to *excellent* (5). Other health status variables included number of long-term illnesses (none, one, more than one) as well as physical limitations related to health problems (not at all, not severe, severe).

Demographic and socioeconomic characteristics measured via the questionnaire included age (year), gender (male, female), marital status (never married vs married, divorced, widowed), highest education attainment in the formal education system (junior high school and below, senior high school, university and above), ability to pay for medication (very difficult, fairly difficult, fairly easy, very easy), and self-perceived social status (low, middle, high).

Health-related behaviors were measured via single self-report items and included smoking status (nonsmoker, former smoker, current smoker), exercise (not able to do, not at all, few times a month, few times a week, almost every day), and other personal behaviors such as community involvement (not at all, seldom, sometimes, and often) and watching health-related TV series with factual TV programs related to health education, health promotion, disease prevention, or special health topics (never, rarely, sometimes, often).

Health care accessibility and use were measured by the frequency of visiting medical doctors in the past 12 months. Accompaniment during the visits (none, sometimes, often) was also measured.

Data Collection

A total of 3083 potential participants were invited to participate in the survey as described in the sampling, which was conducted mostly in the communities, schools, and workplaces. The local study coordinators helped contact the residents by telephone, based on a standardized protocol. The younger people tended to be more active in responding to the invitation. Data were collected through an interviewer-assisted self-report questionnaire, whereas the questionnaire was completed individually by the respondents to guarantee anonymity and collected on-site. The interviewees were asked to fill in the questionnaires by themselves with occasional assistance from interviewers when necessary—for example, people with low vision assisted with reading out the questions). Adequate time was allowed to answer, so that the interviewees could spend more time than usual to finish all the questions on-site. This facilitated the factual perception of the interviewees, and all the questions could be answered. A consent form was also obtained from each participant, specifically, for those participants younger than 18 years; parents and teachers were consulted before the survey, and agreement from the parents was acquired on students' participation. A total of 3072 questionnaires were collected (99.6% response rate). After deleting those with incomplete responses, 2989 valid questionnaires (96.9%) were retained for further analysis.

Data Analysis

The GHL index was standardized to unified metrics from 0 to 50 using the following formula: Index = (Mean − 1) × (50/3), where Index is the specific index calculated, Mean is the mean of all participating items for each individual, 1 is the minimal possible value of the mean (leading to a minimum value of the index of 0), 3 is the range of the mean, and 50 is the chosen maximum value of the new metric. In the resulting index, 0 represents the lowest HL and 50 the highest HL.[18]

Reliability was established using Cronbach's α to examine the internal consistency. To establish construct validity, confirmatory factor analyses (CFA) were conducted separately for the 3 HL domains of health care, disease prevention, and health promotion, whereby items were loaded onto 4 hypothetical factors related to finding, understanding, judging, and applying health information. The fit of the data to the model was examined by goodness-of-fit indices, including (1) absolute model fit: root mean square error of approximation (RMSEA), goodness-of-fit index (GFI); (2) incremental fit: adjusted goodness-of-fit index (AGFI), comparative fit index (CFI), incremental fit index (IFI), and normal fit index (NFI); (3) parsimonious fit or the χ^2 goodness-of-fit test: χ^2/degrees of freedom (df) ratio. More satisfied indices indicate better validity of the questionnaire.[19]

Descriptive analyses were performed to investigate the level of GHL of the participants. Bivariate and multivariate linear regression models were used to identify predictors of HL and associations between GHL and health status, health-related behaviors, and health care accessibility and use. All statistical analyses were performed using the IBM SPSS Version 20.0 and AMOS version 22.0.[20] The significance level was set at $P < .05$.

Ethical Approval

The study was approved by the Joint Institutional Review Board of the Taipei Medical University (TMU-JIRB No. 201305007).

Results

The reliability of the HLS-EU questionnaire as applied with the general population in Taiwan was very high, with the internal consistency (Cronbach's α) for the 47 items equaling .96 and the split-half Spearman-Brown coefficient 0.87.

The results of the CFA showed a good fit of the data to the hypothetical model for the 3 domains of HL. The respective values of the goodness-of-fit indices RMSEA, GFI, AGFI, CFI, IFI, NFI, and χ^2/df ratio were the following: (1) for health care: values of 0.09, 0.90, 0.87, 0.89, 0.89, 0.88, and 23.09, respectively; (2) for disease prevention: values of 0.09, 0.90, 0.85, 0.89, 0.89, 0.89, and 26.70 respectively; and (3) for health promotion: values of 0.08, 0.91, 0.88, 0.92, 0.92, 0.92, and 20.78, respectively (Supplementary Table 1, available at http://aph.sagepub.com/content/by/supplemental-data). RMSEA values of less than 0.1, GFI values of 0.90 and higher, and other indices of 0.85 or higher were considered as good model-data fit.[19] The overall results supported the fitness of the 4-factor structure within each of the 3 domains of the HLS-EU-Q.

The sociodemographics and personal characteristics of these participants are shown in Table 1. Participants were on average 33.8 ± 16.2 years old; 55% of them were female. More than half of the participants were not married, whereas 41.9% were married, 3.2% divorced, and 1.4% widowed. Because of smaller proportions of divorced and widowed individuals and for convenience of analysis, married and divorced/widowed were put in one group for analysis. There was no significant difference in HL between the divorced and widowed group and the married group (P value > .05). Therefore, the married, divorced, and widowed were in one group, as compared with the not married group in the analysis. Also, 85.4% had at least a senior high school education; 68.4% declared it was easy to pay for medication; 58.7% watched health-related TV sometimes or often; and 22.7% were sometimes or often involved in community activities.

The mean GHL index of the population in Taiwan was 34.4 ± 6.6 on a scale of 50, with similar scores for women (34.5 ± 6.3) and men (34.4 ± 6.9). After adjustment for other variables, the higher GHL for men was associated with higher ability to pay for medication, higher self-perceived social status, higher frequency of watching health-related TV programs, and community involvement. For women, higher GHL was associated with younger age, higher ability to pay for medication, higher self-perceived social status, higher frequency of watching health-related TV

Table 1. Sociodemographics and Characteristics of Participants in Taiwan.

	Men (n = 1345)		Women (n = 1644)		Total (n = 2989)	
Characteristics	n	Percentage	n	Percentage	n	Percentage
Sociodemographics						
Age in years						
15-24	522	38.8	864	52.6	1386	46.4
25-34	124	9.2	207	12.6	331	11.1
35-44	170	12.6	248	15.0	418	14.0
45-54	226	16.8	161	9.8	387	12.9
55-64	246	18.3	115	7.0	361	12.1
65-75	57	4.3	49	3.0	106	3.5
Marital status						
Not married	717	53.5	1103	67.2	1820	61.1
Married, divorced, widowed	623	46.5	538	32.8	1161	38.9
Educational attainment						
Junior high school and below	260	19.4	175	10.7	435	14.6
Senior high school	576	42.8	681	41.5	1257	42.1
University and above	509	37.8	785	47.8	1294	43.3
Ability to pay for medication						
Very difficult	76	5.7	83	5.1	159	5.4
Fairly difficult	336	25.2	444	27.0	780	26.2
Fairly easy	718	53.9	874	53.4	1592	53.6
Very easy	203	15.2	237	14.5	440	14.8
Self-perceived social status						
Low	614	47.1	555	34.3	1169	40.0
Middle	629	48.3	1010	62.5	1639	56.1
High	60	4.6	52	3.2	112	3.8
Personal behaviors						
Watching health-related TV						
Never	196	14.8	141	8.6	337	11.4
Rarely	410	30.9	502	30.7	912	30.8
Sometimes	636	48.0	779	47.7	1415	47.8
Often	83	6.3	212	13.0	295	10.0
Community involvement						
Never	707	53.8	771	47.8	1478	50.5
Rarely	321	24.4	460	28.5	781	26.8
Sometimes	159	12.2	181	11.2	340	11.6
Often	126	9.6	200	12.5	326	11.1
Health status						
Self-reported health status						
Poor or fair	65	4.9	73	4.5	138	4.7
Good	612	45.8	853	52.0	1465	49.2
Very good	514	38.4	594	36.2	1108	37.2
Excellent	145	10.9	119	7.3	264	8.9
Long-term illness						
None	824	62.1	1145	69.9	1969	66.5
One or more	502	37.9	492	30.1	994	33.5
Physical limitation related to health problem						
Not at all	874	66.6	1126	69.3	2000	68.1
Limited	439	33.4	498	30.7	937	31.9

(continued)

Table 1. (continued)

Characteristics	Men (n = 1345)		Women (n = 1644)		Total (n = 2989)	
	n	Percentage	n	Percentage	n	Percentage
Health behaviors						
Smoking status						
Nonsmoker	851	63.7	1562	95.4	2413	81.2
Former or current smoker	484	36.3	75	4.6	559	18.8
Doing exercise						
Not at all	243	18.6	288	17.9	531	18.2
Few times a month	351	26.9	505	31.3	856	29.3
Few times a week	517	39.6	662	41.1	1179	40.4
Daily	196	15.0	157	9.7	353	12.1
Health care accessibility and utility						
Frequencies of visiting doctors						
None	244	19.0	195	12.2	439	15.2
1-2 Times	496	38.7	641	40.1	1137	39.5
3-5 Times	368	28.7	511	32.0	879	30.5
6 Times and more	173	13.5	252	15.8	425	14.8
Accompanied to see doctors						
None	207	16.0	131	8.2	338	11.7
Sometimes	436	33.8	492	30.6	928	32.0
Often	647	50.2	983	61.2	1630	56.3

programs, and community involvement. For all the participants, GHL was significantly and negatively associated with age ($b = -0.26$; $P = .016$) and positively associated with ability to pay for medication ($b = 2.84$; $P < .001$), self-perceived social status at the middle level ($b = 1.01$; $P < .001$) and high level ($b = 1.89$; $P = .003$), sometimes and often watching health-related TV ($b = 1.91$ to 4.28; $P < .001$), and community involvement ($b = 1.25$ to 2.18; $P < .001$). Marital status and educational attainment were not associated with HL in this study (Table 2).

The association of GHL with other factors is further demonstrated by multivariate analyses in Table 3. Among male participants, GHL was positively associated with self-perceived health status ($b = 0.24$; $P < .001$), doing exercise ($b = 0.17$; $P < .001$), and frequency of having somebody accompany them to see medical doctors ($b = 0.15$; $P < .001$) but was negatively associated with long-term illness ($b = -0.04$; $P < .05$), physical limitation related to health problems ($b = -0.07$; $P < .001$), smoking ($b = -0.10$; $P < .001$), and frequency of visiting medical doctors ($b = -0.09$; $P < .05$). On the other hand, HL among women participants was positively associated with self-perceived health status ($b = 0.31$; $P < .001$) and doing exercise ($b = 0.18$; $P < .001$) but negatively associated with limitations related to health problems ($b = -0.04$; $P < .05$) and frequency of visiting a medical doctor ($b = -0.11$; $P < .01$; Table 3).

Discussion

This study aimed to validate the HLS-EU-Q to measure HL at the population level in Taiwan. The results indicated that the Mandarin version of the HLS-EU-Q, as used in Taiwan, is a valid and reliable questionnaire, with a high level of internal consistency similar to that observed in the 8 European countries where the questionnaire was developed and to the one used in the Japanese survey.[10,17] Its construct validity was supported by the results of the confirmatory

Table 2. General Health Literacy Associated With the Sociodemographics and Personal Behaviors, by multivariate Linear Regression Analysis.[a]

	Men (n = 1345)			Women (n = 1644)			Overall (n = 2989)		
Predictors	*b* (95% CI)	β	*P*	*b* (95% CI)	β	*P*	*b* (95% CI)	β	*P*
Sociodemographics									
Age with 10 years increment	−0.29 (−0.61, 0.04)	−.07	.087	−0.33 (−0.62, −0.03)	−.08	.029	−0.26 (−0.47, −0.05)	−.06	.016
Marital status									
Not married (reference)									
Married, divorced, widow	−0.70 (−1.77, 0.38)	−.05	.204	−0.05 (−0.91, 0.81)	−.01	.911	−0.34 (−1.01, 0.33)	−.03	.321
Educational attainment									
Junior high school and below (reference)									
Senior high school	0.52 (−0.55,1.59)	.04	.344	0.54 (−0.48, 1.56)	.04	.297	0.51 (−0.23, 1.24)	.04	.175
University and above	−0.11 (−1.21, 0.99)	−.01	.843	0.21 (−0.81, 1.23)	.02	.688	0.03 (−0.70, 0.77)	.01	.928
Ability to pay for medication									
Very difficult (reference)									
Fairly difficult	−0.97 (−2.70, 0.76)	−.06	.272	0.56 (−0.86, 1.98)	.04	.441	−0.19 (−1.29, 0.92)	−.01	.739
Fairly easy	0.33 (−1.34, 1.99)	.02	.699	1.74 (0.36, 3.13)	.14	.014	1.06 (−0.01, 2.13)	.08	.051
Very easy	1.95 (0.10, 3.81)	.10	.039	3.67 (2.12, 5.21)	.21	.000	2.84 (1.65, 4.02)	.16	<.001
Self-perceived social status									
Low (reference)									
Middle	1.51 (0.73, 2.29)	.11	<.001	0.71 (0.08, 1.35)	.06	.027	1.01 (.52, 1.50)	.08	<.001
High	1.74 (−0.10, 3.59)	.05	.064	2.01 (0.33, 3.70)	.06	.019	1.89 (0.65, 3.12)	.06	.003
Personal behaviors									
Watch health-related TV									
Never (reference)									
Rarely	0.31 (−0.88, 1.49)	.02	.615	0.82 (−0.30, 1.94)	.06	.153	0.41 (−0.39, 1.22)	.03	.313
Sometimes	1.80 (0.65, 2.96)	.13	.002	2.39 (1.30, 3.49)	.20	<.001	1.91 (1.13, 2.69)	.15	<.001
Often	4.62 (2.77, 6.47)	.16	<.001	4.59 (3.24, 5.95)	.25	<.001	4.28 (3.22, 5.34)	.20	<.001
Community involvement									
Never (reference)									
Rarely	1.41 (0.49, 2.32)	.09	.003	1.19 (0.50, 1.88)	.09	.001	1.25 (0.69, 1.81)	.09	<.001
Sometimes	1.03 (−0.16, 2.22)	.05	.091	1.99 (1.01, 2.96)	.10	<.001	1.54 (0.79, 2.29)	.08	<.001
Often	1.14 (−0.19, 2.47)	.05	.092	2.94 (1.99, 3.90)	.16	<.001	2.18 (1.40, 2.96)	.11	<.001

Abbreviation: CI, confidence interval.
[a]*b*, nonstandardized coefficient; β, standardized coefficient.

Table 3. General Health Literacy (as a Predictor) and Its Associated Factors (as Dependent Variables) via Multivariate Linear Regression Analyses.[a]

Health Literacy Index With 10 Score Increments	Regression Coefficient *b* (95% CI)[b]		
	Men (n = 1345)	Women (n = 1644)	Overall (n = 2989)
Health status			
Self-perceived health status	0.24 (0.18, 0.29)***	0.31 (0.25, 0.36)***	0.27 (0.23, 0.31)***
Long-term illness	−0.04 (−0.08, −0.01)*	−0.02 (−0.05, 0.02)	−0.03 (−0.06, −0.01)*
Physical limitation related to health problem	−0.07 (−0.11, −0.03)***	−0.04 (−0.08, −0.01)*	−0.06 (−0.08, −0.03)***
Health behaviors			
Smoking status	−0.10 (−0.13, −0.06)***	−0.02 (−0.03, 0.01)	−0.06 (−0.08, −0.04)***
Doing exercise	0.17 (0.09, 0.24)***	0.18 (0.11, 0.25)***	0.18 (0.12, 0.23)***
Health care accessibility and utility			
Frequency of visiting doctors	−0.09 (−0.17, −0.01)*	−0.11 (−0.18, −0.03)**	−0.10 (−0.15, −0.05)***
Accompanied to see doctors	0.15 (0.09, 0.21)***	0.03 (−0.02, 0.08)	0.08 (0.04, 0.12)***

[a]Significant at *.01 < *P* < .05; **.001 < *P* < .01; ***P < .001. Health literacy index range from 0 to 50.
[b]Nonstandardized regression coefficient adjusted for age, gender (for overall sample), marital status, education, social status, and ability to pay for medication.

factor analyses, which confirmed the hypothesized component structure for the 3 domains of health care, disease prevention, and health promotion. The results also showed that HL levels of men and women in Taiwan were significantly different for groups within the population that had different sociodemographic characteristics, which attests to the questionnaire's discriminative validity.[21] As such, these findings suggest that HLS-EU-Q can be a useful tool to study HL at the population level in non-European countries, including Taiwan and other countries in Asia.

The results of the survey showed that higher GHL is significantly associated with younger age, higher ability to pay for medication, and higher social status, which is consistent with the findings from the European study using the HLS-EU-Q[10,12] and with studies using other tools in Canada and the United States, showing that HL is generally lower in older individuals and among those with low incomes.[7-9] The findings also confirm those of previous studies indicating that HL is significantly related to poor health status.[6,18]

Consistent with other studies, age was also found to be negatively associated with HL in Taiwan.[7-10,18] This can be explained by the fact that aging is related to a decline in cognitive functions.[22,23] In contrast, the study via the same HLS-EU-Qs conducted in Japan demonstrated that HL increased with age.[17] Another study conducted in China using different survey tools reported that HL was higher in younger groups.[11] The study in Japan was based on a Web page survey,[17] whereas that in China was confined to 1 province.[11] The above results might not well represent the whole population in the countries. Further investigations are needed in different populations in Asia to elaborate the association between age and HL.

There was no significant difference in HL in this population at different levels of education. The years of formal education in Taiwan might contribute less to the knowledge and skills needed by individuals in the health care system in Taiwan and their HL.[23] Interestingly, the current study found that a higher frequency of watching health-related TV programs and more community involvement were both positively associated with higher HL. It has been observed in previous studies that health promoting series or entertainment-education television programs could increase health knowledge and healthy behaviors.[13-15] In addition, health-related community activities were shown to improve HL.[7]

Those with higher HL in this study reported better self-perceived health status, less likelihood of smoking, and doing more exercise, which was consistent with observations in other studies in Taiwan and Japan.[6,24] The negative association between HL and long-term illnesses as well as

health-related physical limitations could be explained by the fact that people with lower HL had a lower ability to manage their health.[18] In contrast, those with higher levels of HL may pay fewer visits to their doctors. On the other hand, HL was higher if patients were accompanied when visiting their medical doctors. It suggested that support from family and friends provided a better opportunity for sharing health-related knowledge received from these visits.[25]

Strengths and Limitations

This study is not without its limitations. One limitation is that all the measurements in this study were based on self-reports, which may have been prone to response and information bias. On the other hand, younger people were more active to respond to the invitation to participate in this study than older people. Therefore, the age distribution was not well represented for the whole population, and results were rather representative of a younger population in Taiwan. In this regard, it is to be noted that the HLS-EU-Q is a subjective measure of HL, which is different from objective tests of HL such as Rapid Estimate of Adult Literacy in Medicine[26] or the Test of Functional Health Literacy in Adults.[27] However, this subjective tool is conceptually based and allows a broader assessment of HL because the HLS-EU emphasizes individuals' ability to make decisions related to health care, disease prevention, and health promotion.[4] Moreover, the subjective nature of the assessment allows one to measure HL in countries with different cultures as well as in different socioeconomic and health care system backgrounds.

It is also acknowledged that this study was cross-sectional and, therefore, cannot demonstrate causality between the factors associated with HL. Future longitudinal studies are recommended to better understand the relationship and causal effects of HL of the general public in various countries.

Conclusion

The HLS-EU-Q, which was developed and used in several countries in Europe, was shown to be a valid and useful tool to assess the level of HL in the general population of Taiwan. It has been demonstrated to be a potentially effective tool for future international comparative studies in Asian countries. The results indicated that higher HL was associated with younger age, higher ability to pay for medication, higher self-perceived social status, more frequency of watching health-related TV, and community involvement. Higher HL was also significantly associated with better health statuses of the individuals, their health behaviors, and health care accessibility and utility.

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