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HEALTH LITERACY ASSESSMENT OF VIDZEME STATISTICAL REGION

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Abstract. Data on Health Literacy in the population of Latvia is limited. The aim of the study was to determine the Health Literacy impacting factors of inhabitants of Vidzeme Statistical region in Latvia (LV008). Respondent survey (n = 383), using a paper-and-pencil self-administered approach and telephone interviews, was conducted based the European Health Literacy Survey Questionnaire (HLS-EU-Q47). In order to ensure internal consistency and reliability, the authors used Cronbach's *α* test (*α* = 0.965). The confirmatory factor analysis (CFA) allowed to determine that factor results differentiate between genders and there is a strong positive correlation (r = 0.945), that impacts results. Factors *Access, Appraise* and *Apply* explained each 30 % of the variance, and factors *Understand* explained 31 %. HL index division by gender indicated that 47.4 % of female respondents and 46.6 % of male respondents have "limited health literacy" ("inadequate" + "problematic"). The largest age group among respondents are 18-39-year old where there is lower level of education and lower income. However, cases have been observed when respondents even with higher education have "limited health literacy," which indicates towards a need for further HL research in Latvia, because compared to HL of other member states, LV008 HL index is by 38.9 % larger than the EU average (47.6 %).

Key words: health literacy.
JEL code: I12; I13

Introduction

The European Health literacy research (HLS-EU) indicates that on average 47 % respondents have encountered difficulties in health management (Sorensen, 2015). The limited health literacy is an actual health risk for the society ever more during the spread of COVID-19. Multiple EU member states are researching the knowledge, motivation, competencies of people to access information on topics concerning health, to understand that, to evaluate, and to use it in order to make conclusions and take appropriate decisions in everyday life concerning the healthcare, disease prevention, health improvements and life quality (ABS, 2009; Berkman et al., 2011; Altin, 2014; Connor, Mantwill, and Schulz, 2013; Guzys, Kenny, Dickson-Swift, 2015).

Health Literacy (HL) as a term was defined first in 1974 (Pelikan, 2014). Over the years multiple HL definitions have been proposed (Berkman et al, 2010; Freedman et al, 2009, Kickbusch, Nutbeam, 2008). However, the definition itself has been created by the National Library of Medicine, and that defines the HL as the level at which person can acquire, process and understand the basic information about the health and healthcare services, which is necessary to take responsible health related decisions "the knowledge, motivation and competences to access, understand, appraise and apply health information in order to make judgments and take decisions in everyday life concerning healthcare, disease prevention and health promotion to maintain or improve quality of life throughout the course of life" (Sorensen et al., 2012).

The essence of the HL definition is focused on the ability to search, find, acquire, understand, evaluate and use health information, in order to take based decisions about individual health condition and the health of society (Sorensen et al., 2012).

Researchers identified that high HL is linked to profound knowledge about the health, less frequent cases of sickness and reduced expenditures linked to sickness (Mancuso, 2008; Baker, 2006). However, low HL is equivalent to average knowledge about health issues and is linked to higher rates if sickness and increased health services are related with expenses (Scott et al, 2002; Kim, 2009; Rowlands, Protheroe, Price, Gann, Raf, 2014; Wallace, Perkhounkova, Bohr, Chung, 2016). However, there is a variety of other

factors that are linked to HL, linked to sex, education, occupation, income level i.e. demographical and socio-economic factors of respondents. (Solar, Iewin, 2010; Bodur, Filiz, Kalkan, 2017).

The OECD and the Government of Latvia have identified HL as a priority that ought to be developed. The research into HL is aimed at the role of patient satisfaction with the healthcare services, at the development of HL skills (Rasnaca, Vibane, Nikisins 2017; Onose et al., 2017; Silkane, Davidsone, Veliverronena, 2018). When assessing and comparing the HL situation in Latvia with that in other EU member states, it does not look bright (Heijmans at el., 2015).

Authors believe that HL and its factors have not attracted significant attention in the public space, and information about the health and health literacy is available in a limited amount. Consequently, the First Global Health Literacy Summit by the International Health Literacy Association (IHLA) has raised the need to affirm the importance of health literacy (IHLA, 2021).

Taking into account the lack of HL information basis in Latvia, which was indicated by the European Commission study (Heijmans at el., 2015), authors suggested the **following aim**: determination of factors affecting health literacy of the population of Vidzeme statistical region in Latvia. **The research tasks**: (1) to carry out analysis of scientific literature about health literacy survey HLS-Q (questionnaire), used methods in factor determination; (2) to carry out survey, to determine and evaluate factors limiting the HL; (3) to determine the HL index divisions by gender, age, education, and gross income per month; (4) to compare the statistical sample of Vidzeme Statistical Region HL index with that of other EU member states.

The methods applied: descriptive method, Pearson's correlation, Chi-square test, KMO and BARLETT'S, Cronbach's Alpha, Manova and Mancova tests, Exploratory Factor Analysis and Principal Components Analysis.

Materials and methods

The Statistical region Vidzeme (LV 008) as a research region is one of six regions of Latvia (NUTS III) (Nomenclature of territorial units for statistics, small regions for specific diagnoses), where the number of population of working age (in the range of 18-64 years) population according to the Central Statistical Bureau (CSB), is 383 respondents, calculation of survey respondent size has been created proportionally 110 868 (CSB, 2020). The calculated sample size is to LV 008 working age population. The survey was conducted from May 2020 till December 2021, while deployed with mixed technique, using a paper-and-pencil self-administered approach (PAPI), and phone interviews.

HL was based on the HLS-EU-Q47 (Sorensen et al., 2013). The questionnaire consists of 47 items of which must be rated on 4-point Likert scales (1 = very difficult, 2 = difficult, 3 = easy, and 4 = very easy), which identifies 4 competences related to managing health information (access, understand, appraise, and apply information). This allows the calculation of a general HL index and index of each of the 4 competencies. The HL indices were standardized to unified metrics from 0 to 50 using the formula (HLS-EU Consortium, 2012):

$$\text{Index} = (M-1)\times(50/n)\ , \qquad (1)$$

where

index – was the specific index calculated;

M – the mean of all participating items for each person;

1– was the minimal possible value of the mean (leading to a minimum value of the index of 0);

n – was the range of the mean;

50 – was the chosen maximum value of the new metric.

The acquired HL index was grouped according to value in 4 groups: 0-25 – inadequate; >25-33 – problematic; >33-42 – sufficient, and >42-50 – excellent HL, in order to evaluate the HL of respondents according to gender, age, education, and gross income per month (EUR) and to compare to other countries. To detect vulnerable groups, the "inadequate" and "problematic" levels were combined to a single level, called "limited health literacy" (0-33) (Sorensen, 2015).

In order to test the internal consistency, reliability test Cronbach's α was conducted. Correlation and regression analysis was performed. The results were considered at the level of significance $p < .05$, $p < .01$ and $p < .001$.

Research results and discussion

During the study, analysis of 10 researches from 2015 to 2020 was conducted, including 17 countries (Austria, Bulgaria, Germany, Greece, Indonesia, Ireland, Japan, Kazakhstan, Korea, Malaysia, Myanmar, Netherlands, Norway, Poland, Spain, Taiwan and Vietnam). The research revealed that for basis for similar researches the European Health Literacy Survey Questionnaire HLS-EU-Q47 conceptual model of HL (Sorensen et al., 2012) or its variation HLS-SF-Q12 (The 12-Item Short Form Health Survey), HL-SDH-Q33 (Health literacy on social determinants of health), HLS-EU-Q86 was used, which differs according to survey questions 12-86, according to the number of respondents from 403 to 10 024, as well as according to the profile of topics of interest in a given research. The analysis indicated the following methods and tests: Confirmatory factor analysis (CFA), Factor analysis, Principle component analysis (PCA), correlations (Pearson and Spearman's), regressions (Multiple linear), Cronbach's and Spearman-Brown methods, Anova, Kaiser-Mayer-Olkin (KMO), Bartlett's test and Chi-squared test. Thus authors chose to use most of the listed methods.

The research was based on HLS-EU-Q47 and while carrying out internal consistency test, it was found out that the alpha coefficient for the 47 items is 0.965, $\alpha > 0.8$, suggesting that the items have high internal consistency.

In the second task of the research the following demographical and socio-economic data on respondents were collected:

Participants. In the study 383 adults (49.9 % male and 50.1 % female) in age from 18 to 64 (18-19 (27.4 %); 20-29 (35 %); 30-39 (30.5 %); 40-49 (2.6 %); 50-59 (2.6 %); 60-64 (1.8 %)) (M = 2.23, SD = 1.08) participated.

The education of respondents was from primary or lower than primary to higher (higher (27.4 %); vocational or vocational secondary (35.0 %); general secondary (30.5 %); primary or lower than primary (7 %)) (M = 2.17, SD = 0.913).

Gross income per month (EUR) was from <= 200 EUR to 1500 EUR> (M = 2.39, SD = 1.111), <400 EUR 23.2 %); 400-700 EUR (35.8 %); 700-1000 EUR (24.0 %); 1000-<1500 EUR 12.3 %); 1500 EUR > (4.7 %).

Principal axis factor analysis with varimax rotation was conducted to access the structure for the 47 items, which identifies 4 factors related to managing health information (access, understand, appraise, and apply information). The assumption of independent sampling was met. Kaiser-Meyer-Olkin Measure (KMO) measure should be greater than 0.70 indicating sufficient items for each factor (Table 1).

The assumptions of normality, linear relationships between pairs of variables, and the variables' being correlated at a strong level were checked. For construct validity, confirmatory factor analysis (CFA) was conducted. Four factors were requested, based on the fact that the items were designed to index four aspects of health literacy: access, understand, appraise, and apply information. After rotation, the first

factor *Access* accounted for 21 % of the variance, the second factor *Understand* accounted for 17 %, and the third factor *Appraise* 12 %, and the fourth factor *Apply* for 9 % of the variance.

Table 1

KMO and Bartlett'sTest

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		**0.951**
Barlett'sTest of Sphericity	Approx. Chi-Square	20313.743
	df	1081
	Sig.	0.000

Source: author's calculations

In the CFA, we used the comparative fit index (CFI) and the root mean square error of approximation (RMSEA) as the model fit indices. A CFI value ≥0.90 was considered to indicate acceptable model fit. For the RMSEA, a value <0.05 represented good fit, and a value <0.08 was considered acceptable (Kline, 2010).

The first factor, which seems to index *Access*, had 24 items, of which 9 was strong loadings on such items: 17) …find information about how to manage unhealthy behaviour such as smoking, low physical activity and drinking too much? 24) …judge how reliable health warnings are, such as smoking, low physical activity and drinking too much? 32) …find information about symptoms of illnesses that concern you? 23) …understand why you need health screenings? 2) …find information on treatments of illnesses that concern you? 7) …understand what to do in a medical emergency? 15) …call an ambulance in an emergency? 9) …judge how information from your doctor applies to you? 29) …decide if you should have a flu vaccination?

The second factors, which seemed to index *Understand*, had 23 items, of which high loadings on the next five items, where >0.8 : 33) …find information on treatments of illnesses that concern you? 14) …follow the instructions on medication? Other items, that are >0.7: 16) …follow instructions from your doctor or pharmacist? 25) …judge when you need to go to a doctor for a check-up? and 18) …find information on how to manage mental health problems like stress or depression? However, >0.6 is for following items: 6) …understand the leaflets that come with your medicine? 10) … judge the advantages and disadvantages of different treatment options? 27) …judge which health screenings you should have? 22) …understand why you need vaccinations?

The third factors, had 18 items, of which seemed to index *Appraise*, had high loadings on the next 6 items: >0.8 there is 36) find out what to do in case of a medical emergency? More than 0.7 3) find out what to do in case of a medical emergency? Items > 0.6 there are 4) find out where to get professional help when you are ill? And 40) find out what to do in case of a medical emergency?

The fourth factors, had 16 items, of which seemed to index *Apply*, had high loadings only two next items: > 0.6 there was 38) …find information on treatments of illnesses that concern you? and > 0.5 there was item 41) …find information about symptoms of illnesses that concern you?

Hierarchical Multiple Regression (in SPSS with Assumption Testing) analysis was performed to determine the role of gender, education, age and gross income per month (EUR) in health literacy predicting (*Access, Understand, Appraise* and *Apply*). The assumptions of linearity, normally distributed errors, and uncorrelated errors were checked and met. Further problems were identified, such as a high correlation indicating high correlation among some predictors (age and education r = 0.945) and low multicollinearity 0.105 (tolerances are well over 0.57 ($1 - R^2$).

When gender was entered alone, it significantly predicted HL factor *Access*, $F(1, 830) = 0.51$, $p = 0.478$), adjusted $R^2 = 0.01$, however, as indicated by R^2, < 1 % of the variance in HL factor *Access*.

When the other variables (gender, age, education and gross income per month) were added, they significantly improved the prediction, R^2 change = 0.30. This indicate that 30 % of the variance in *Access* was by model. Combination of variables significantly predicted Access, gender (β = - 0.006, p = 0.849), age (β = 0.95, p = 0.23), education (β = 0.100, p = 0.62), gross income per month (β = 0.223, p < 0.00), F (4,827) = 89.786, p < .001), with all four variables. The partial correlations can be explained as variance that is not explained by any of the other variables, each independent variable is explaining in the outcome variable, therefore age un education can explain the least unique amount of dispersion that age and education explains the least amount of unique variance 5 %, but gross income per month reach even 18 %. Among male participants, HL was positively associated with age (β = 0.19; p = 0.003), gross income per month (β = 0.34; p < .001), but was negatively associated with predictor education (β = - 0.34; p = 0.003).

To investigate how HL factor *Understand* impacts the predictors, a correlation was identified (age and education r = 0.945). When gender was entered alone, it significantly predicted HL factor Understand, F (1, 830) = 1.15, p = 0.285), adjusted R^2 = 0.10, However, as indicated by R^2, 10 % of the variance in HL factor *Understand*. When the other variables (gender, education, age and gross income per month) were added, they significantly improved the prediction, R^2 change = 0.31. This indicate that 31 % of the variance in *Understand* was by model. Combination of variables significantly predicted Understand, gender (β = - 0.049, p = 0.093), age (β = 0.22 p = 0.592), education (β = 0.235, p< 0.001), gross income per month (β = 0.207, p <0.001), F (4, 827) = 94.091, p < .001), with all four variables.

To investigate how HL factor *Appraise* indicated that when the other variables (gender, age, education and gross income per month) were added, they significantly improved the prediction, R^2 change = 0.30. This indicate that 30 % of the variance in *Appraise* was by model. Combination of variables significantly predicted *Appraise*, gender (β = - 0.027, p = 0.372), age (β = 0.37 p = 0.367), education (β = 0.217, p< 0.001), gross income per month (β = 0.204, p < 0.001), F (4,827) = 94.091, p < .001), with all four variables.

To investigate how HL factor *Apply* when the other variables (gender, age, education and gross income per month) were added, they significantly improved the prediction, R^2 change = 0.30. This indicate that 30 % of the variance in *Apply* was by model. Combination of variables significantly predicted *Apply*, gender (β = - 0.033, p = 0.255), age (β = 0.35, p = 0.383), education (β = 0.117, p = 0.001), gross income per month (β = 0.220, p <0.001), F (4,827) = 94.091, p < .001), with all four variables.

HL index division (Table 2) according to gender indicate, that out of 192 respondents 47.4 % for women and out from 191 respondents for 46.6 % for men is a "limited health literacy" ("inadequate" + "problematic"). "Excellent" HL evaluation is by 9.8 % higher for women, but "sufficient" HL index is by 5.8 % higher for men. The evaluation 'limited health literacy" was estimated the largest number for respondents from 18-19, 20-29 and 30-39-year groups. In between the different age groups the evaluation "excellent" HL it was a dominant value in the age group 30-39 and 60> years, that can be explained with higher education. This is due to the fact that respondents with lower education specifically with general secondary education 51.3 % and primary or lower than primary 44.4 % indicate that 'limited health literacy "HL, is more pronounced in groups with lower gross income per month (EUR).

In comparison with other European countries (Fig. 1), if the proportion of people with "limited health literacy" considerably exceeds the average (47.6 %) observed for the overall sample, then for LV008 this amount is by 38.9 % larger.

This research was aimed at a research area that has not been sufficiently analysed in Latvia, i.e., health literacy and health literacy impacting factors and their determination within the inhabitants in the Vidzeme

statistical region of Latvia. There were 47 questions deployed in HL matrix that were used in European countries (Sorensen et al., 2015). When confirmatory factor analysis (CFA) was conducted, four factors were determined: (1) *Access*, included 24 items on availability of information – unhealthy behaviour such as smoking, low physical activity and drinking too much, find information about symptoms of illnesses that concern; (2) *Understand*, had 23 items information on treatments of illnesses, instructions on medication; (3) *Appraise* had 18 items found out what to do in case of a medical emergency, find out where to get professional help when you are ill; (4) *Apply*, where 16 items were determined, about finding of information on treatments of illnesses that concern you, about symptoms of illnesses that concern you. Thus, the second task of the study was fulfilled.

Table 2

HL index division by gender, age, education, and gross income per month

Predictor variables		HL index (%)				N
		0-25	>25-33	>33-42	>42-50	
Gender	Women	16.6	20.8	32.9	29.7	192
	Men	14.6	22.0	43.5	19.9	191
Age	18-19	6.7	1.9	17.1	74.3	95
	20-29	14,2	24.6	57.5	3.7	134
	30-39	51.3	30.8	9.4	8.5	117
	40-49	60.0	30.0	0.0	10.0	10
	50-59	50.0	40.0	10.0	0.0	10
	60>	14.4	57.1	14.3	14.3	7
Education	Higher	6.7	1.9	17.1	74.3	105
	Vocational or vocational secondary	14.2	24.6	57.5	3.7	144
	General secondary	51.3	30.8	9.4	8.5	117
	Primary or lower than primary	44.4	40.7	7.4	7.4	27
Gross income per month (EUR)	<=200	52.8	28.3	18.9	0.0	53
	200-400	37.8	32.4	29.7	0.0	37
	>400-700	27.2	21.3	32.4	19.1	136
	>700-1000	9.6	13.8	29.8	46.8	94
	>1000-1500	17.8	24.4	22.2	35.6	45
	>1500	11.1	11.1	27.8	50.0	18

Source: author's calculations based on the results of the survey

Source: author's calculations based on Sorensen et al., 2015

Fig. 1. **Levels of health literacy index by country and LV008**

The identification of HL importance by OECD and the Government of Latvia (IHLA, 2021) increased the interest of authors to research into demographic and social predictors, that could impact HL, for instance, gender, age, education, and gross income per month (EUR), based on Sorensen and other authors (Solar, Iewin, 2010; Sorensen et al., 2012; Bodur, 2017). Taken into account that the calculations of the survey respondents was carried out proportionally to LV008 working age population, therefore the research results were aimed at reaching the given cohort of respondents.

In the research Model 1 it was determined that gender does not significantly impact (only 1 %) HL factor *Access*. However, the Model 2 indicates that, when all health literacy domains were added to regression,

they improved the prediction of respondents *Access* to 30 %. Predictors age and education has a strong correlation (r = 0.945), that similarly to the partial correlation has an impact on factor *Access*. Education of female respondents is higher than that of men which is indicated by their negatively associated with predictor education. Similar phenomena can be identified within analysis of *Understand, Appraise,* and *Apply*. The female respondents are more dominant in categories with higher and general secondary education, but in male respondent groups the dominant categories are vocational or vocational secondary, and primary or lower then primary education. The adjusted R squared value for male factor *Access* was 27 %, Understand 29 %, *Appraise* 27 %, and *Apply* 30 %. However, for females the adjusted R squared value factor *Access* and *Understand* were 35 %, *Appraise* 34 %, and *Apply* 30 %, which is related mainly to the education of women. However, the gross income per month (EUR) of respondents impact all factors, especially for females (gross income per month (EUR)* education, r = - 0.284; gross income per month (EUR)* age, r = - 0.267).

In previous research (Macleod et al., 2017), noted that the respondent HL level is lower especially for people in more senior age, which also affects their abilities to respond to the health problems, thus they have limited Access. Nonetheless in authors research this cohort does not significantly differ from other groups of respondents, but the most important differences are in education. It has been proved that education is the strongest factor what affects health literacy (Martin et al, 2009). It should be taken into account that the education level of respondents only reflects the time spent in education system but not the actual HL skills (De Walt, Pignone, 2005). The authors identified these inconsistencies in between respondents of different education levels and HL skills. The common tendencies can be observed (Fig. 1), where, compared to evaluation of the HL index by foreign researchers indicated that respondents of LV008 in "limited health literacy" level exceeds that of Bulgaria by 24.4 %.

There were limitations in this study. The primary limitation was that the research was conducted on a relatively limited number of inhabitants and bound to a given region – in Vidzeme statistical region LV008. Therefore, before the conclusion were generalized in order to acquire better and more detailed understanding about the health literacy and the related factors, it was recommended to carry out similar research in other regions of Latvia. The second limitation was that, due to fact that a large proportion of respondents were youth, a research should be conducted that has a more proportionate division between different age groups. The third limitation included the division by four demographic and social factors (gender, age, education and gross income per month (EUR)) while excluding other factors, including the cultural factors.

Conclusions and recommendations

The research allowed to determine four Health Literacy impacting factors within the Vidzeme Statistical Region of Latvia (LV008): *Access, Understand*, *Appraise*, and *Apply*. Study revealed that according to respondents' gender different Health Literacy factor impact was determined. Factors *Access* and *Understand* in female respondent population were 35 %, *Appraise* 34 %, and *Apply* 30 %, meanwhile for male respondents the factor Access was 27 %, Understand 29 %, *Appraise* 27 %, and *Apply* 30 %. Differences were related to the higher education among female respondents, as well as lower impact of the predictor of gross income per month (EUR). It was determined that there are inconsistencies between different levels of education and HL factors.

European wide research on levels of health literacy index by country revealed that the proportion of responses indicating HL index "limited health literacy" in Vidzeme statistical region of Latvia exceeded even

the other largest result by a member state i.e., Bulgaria, where its national HL index for the given answer was by 24.4 % lower than that of Latvia.

in order to gain a better and more detailed understanding of health literacy and related factors, it was recommended to conduct similar researches in other regions of Latvia, in different age cohorts, as well as to include several demographic and social factors.

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