



## ECONOMIC IMPLICATIONS OF INSUFFICIENT HEALTH LITERACY

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### ABSTRACT

The main goal of this paper is to elaborate the importance of health literacy in cost-effective utilization of health care services which influence the efficiency of the entire health care sector. In order to complement the theoretical framework of the economic implications and the circular influence of health literacy on the economy, an empirical analysis was carried out using S-TOFHLA. The results suggest that the patients' personal characteristics and the accessibility to health care services influence the level of health literacy which affects the health care costs.

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## I. INTRODUCTION

One of the main reasons for an inefficient health care (HC) market is the lack of consumer (patient) sovereignty and its inability of making rational choices which cause difficulties in assessing the usefulness of HC services (Zweifel, Breyer and Kifmann, 1997) and increases the agency related costs in HC. In the HC market there is knowledge and information asymmetry between users and providers of HC, making the agency relationships very complex and, therefore, a very fertile research issue. Its importance has been emphasized since the 1970s as a part of broader orientation on the patients' skills and capabilities to meet the requirements of the modern society.

The problem of increasing expenditures and inefficient HC in Croatia imposes the need for continuous HC reforms. In order for the reforms to be efficient, it is essential to take the holistic approach to the HC system. Therefore, it is important to take the patients' side into perspective and to account for their health literacy (HL) as *"the personal, cognitive and social skills which determine the ability of individuals to gain access to, understand, and use information to promote and maintain good health"* (Nutbeam, 2000). Hence, the main goal of this paper is to examine the factors influencing the populations' HL in order to better understand the economic effects of HL and the circular influence of HL on the economy.

To the best authors' knowledge, this research is the first on HL in Croatia. A comprehensive test for measuring the individual level of HL, S-TOFHLA was used and therefore translated into Croatian. Because of significant differences of language and HC system between USA and Croatia, the S-TOFHLA underwent some adjustments. In order to maintain the originality of the S-TOFHLA, experts in the fields of economics, medicine, language and sociology were consulted.

According to Fuchs (2000), the future of health economics relies on better understanding of economic behavior in HC and its usefulness regarding HC decision making. Respectfully, research on HL, which undoubtedly generates numerous economic implications, complements the above mentioned fields of economic research.

Beside the introduction, this article has the following structure. Section II discusses about the agency costs that arise on the HC market as well as the economic effects of inadequate HL. Section III brings the results and the major findings of the research and offers an empirical model for estimating HL from multiple variables. Section IV draws out the main conclusions of this research.

## II. AGENCY COSTS IN THE HEALTH CARE MARKET

Perfect market mechanism represents the golden standard of a resource allocation which allows producers/service providers and consumers to operate freely and independently. However, HC is not a product/service to which the principles of purely economic goods can be applied. For this reason HC is a matter of public policy and administrative decisions.

One of the reasons for the existence of an inefficient HC market is the lack of consumer (patient) sovereignty. This refers to the patient's inability to make rational choices (Zweifel, Breyer and Kifmann, 1997). Lack of perfect information is not an exclusive characteristic of the HC market, but is also present in many other markets and is the reason for insufficient market transparency. The problem of patient's sovereignty is pronounced in the HC market because patients lack the ability to make rational choices and to evaluate HC services objectively. Also, the causality between treatment and health status may be affected by various biological processes, making an objective judgment of HC almost impossible. Finally, in the HC market there is knowledge

and information asymmetry between users and providers of HC, making the patient-physician relationship very complex and a fertile research topic. The existence of agency relationships, the divergence between physicians and patients goals and the information asymmetry are causing agency costs (Jensen and Mackling, 1976) to the health service market.

One of the main reasons for the occurrence of agency problems in HC is that the patient does not have enough knowledge about the actions that the physician should take. This violates the basic principle of the agency theory according to which the principal (patient) knows exactly what actions the agent (physician) should take. This puts the agent into a monopoly position. Also, the patient's demand for HC depends both on his health state and the way the physician evaluates his health state regarding his medical knowledge. However, it is not rare that the patient or the third party (payer) cannot directly evaluate the usefulness of his advice (Cerović, Dukić and Horvat, 2012). Even if there is a possibility for the physician to be supervised by the patient, he cannot pass judgment on whether the physician's action is appropriate or not, while the health outcome itself is not a perfect function of the received HC due to many other factors that affect health.

Optimal consumption of HC means using HC effectively in a way that individuals could evaluate health within their utility function (Hurley, 2000). Patients know best how the improvement of their health status affects their well-being (utility level), while doctors have better information on alternative health interventions in treatment and prevention. Therefore, patients should be in the position of making informed decisions about HC utilization which, among other, requires an adequate level of HL.

The term HL was firstly introduced as part of the research „Health Education as Social Policy“ by the Johns Hopkins University in Baltimore (Simonds, 1974), while further interest in HL in USA (leading country in HL research and measurement) have arisen after the findings of the 1992 National Adult Literacy Survey (NALS). According to this survey, of 191 million adult Americans, 40–44 million were insufficiently functional health literate and another 53.5 million were marginally functional health literate (Kirsch et al., 1993). Since a significant percentage of the population has inadequate levels of HL, the lack of HL is an important problem, also called “silent epidemic” (Perker et al., 2003). Inadequate HL is also a major generator of economic inefficiency in the HC system (Vernon et al., 2007). Some researchers even suggest that advancing HL may become a global challenge for the 21<sup>st</sup> century (Nutbeam and Kickbusch, 2000).

## **A. Health literacy and its economic implications**

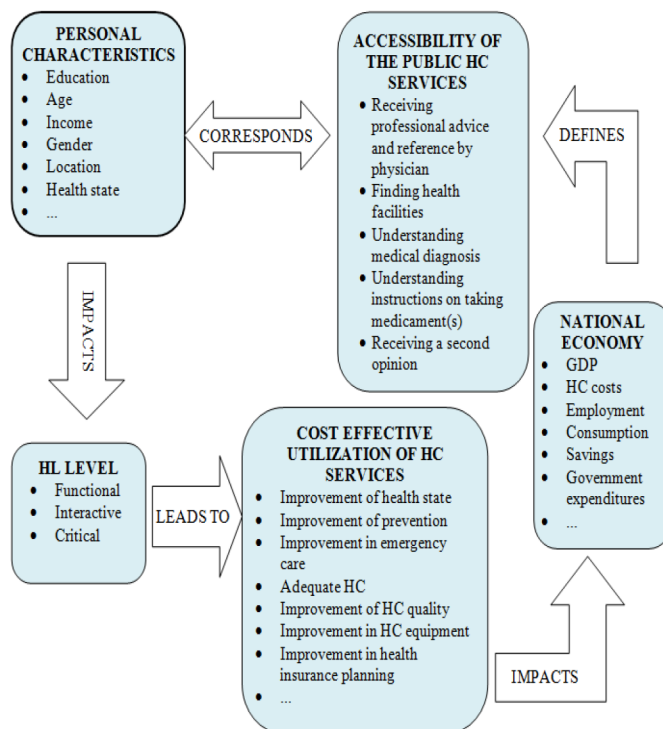
The three most widely accepted areas of HL defined by Nutbeam (2000) include functional, interactive and critical HL. Functional literacy is the first area of HL and it refers to basic reading and writing skills that allow effective functioning in individual health domain (ability to read health information about health risks factors as well as ability of using the health services within the HC system). The second area of HL refers to interactive HL that involves use of more advanced skills like cognitive, literacy and social. These skills can be used in purpose of participation in different health activities, understanding different forms of health messages and application of health information in changing circumstances. The third area - critical HL encompasses even more advanced cognitive and social skills that are used for critical analysis of health information, improvement of individual and social capacity and understanding of political and economic dimensions of health.

HL is recognized as shared function of individual and social factors, and most conceptual models have identified the individual as well as the system-level factors that influence a person's

level of HL. Lee, Arozullah, and Cho (2004) suggest that social support may moderate the impact of low HL on health status and health service use.

The principal goal of public health policy is the improvement of population health by means of available resources with maximum health outcomes, and, beside health implications, insufficient HL also causes economic implications, as shown in figure 1.

FIGURE 1 – CIRCULAR INFLUENCE OF HEALTH LITERACY



Source: Author

Many HC systems are characterized by increasing health spending and a sort of HC crisis, which is not caused solely due to the lack of money (Pelletier et al., 2009), but also due to the non-compliance of HC spending, the fragmentation of HC services, the non-existence of continuous HC and the inadequate funding of cost-effective interventions. Health policies designed to improve HL among the population have major influence on reducing health care costs and utilization of preventive activities (Vernon et al., 2007).

Observed from an economic standpoint, the demand for HC derives from the demand for good health (Grossman, 2000) and by investing in health (health capital) an individual can increase its level of utility because of the improved health. Conceptually, HL can be observed as one of the preconditions for achieving good health while the individual HL level affects the efficiency of the HC system (Howard, Gazmararian and Parker, 2005; Weiss and Palmer 2004).

Poor health affects the economy through spending and savings (capital formation), as well as the level of education (Suhrcke et al., 2006). Reduced household consumption and the level of

education, due to illness, have a negative impact on gross domestic product, while at the same time HC expenditures across Europe are taking an increasingly large share in the public and private consumption. Empirical research at the micro level shows that chronic diseases reduce wages, earnings, labor force participation and productivity, affecting also early retirement, disability benefits and high rate of employee turnover (Suhrcke et al., 2006).

Inadequate communication, insufficient information and instructions which patients hardly understand cause barriers while using HC and inefficiency in health capital production.

## **B. Health literacy empirical research**

An empirical research indicates that insufficient HL can cause inefficiency in the HC system. Insufficient HL is linked to poor health status (Baker et al. 2007) and scarce use of preventive HC (Nielsen-Bohman, Panzer and Kindig, 2004; Pignone et al., 2005). It is important to emphasize that in some cases (Nutbeam, 2000) HL is viewed as a key outcome of health promotion/prevention of the disease. They cover the aspects that increase HL such as the improvement of knowledge of health, the impact on changing attitudes and the development of certain skills. Furthermore, insufficient HL results with increasing hospitalization (Baker et al. 1998, 2002; Schillinger et al., 2002) and health system costs (Vernon et al., 2007; Friedland, 2002; Weiss and Palmer, 2004).

In recent researches, the influence of patients' HL level on the quality of their HC was investigated. Most of them studied health or social outcomes of poor HL (Gazmararian et al., 1999; Adams et al., 2013). On the other hand, the economic implications were neglected. A first systematic review of the economic implications of low HL is made by Eichler, Wieser and Brügger (2009). They emphasize low HL as a problem that can create substantial costs in the HC system (per year, on the system level: 3–5% of the total cost of HC and on the patient level: \$143–7798 per person). Adequate HL can help patients to reach good health level without creating additional unnecessary costs. Weiss and Palmer (2004), Friedland (1998, 2002), Vernon et al. (2007) studied the relationship between HC costs and insufficient HL and proved that the latter generates negative economic consequences through higher HC costs. Their research provided a quantitative estimation of additional costs incurred due to low HL. Weiss (2003, 2007) pointed out that insufficient HL creates great impact on the American HC system by causing huge cost burdens. Their research indicates that people with low HL generate more than four times higher costs than people with high HL. Research studying the impact of limited HL on costs have been made on the patient level (Howard, Gazmararian and Parker, 2005; Weiss and Palmer 2004; McCormack et al., 2010) and on the system level (Friedland 1998; Vernon et al., 2007). They concluded that low HL leads to higher costs at the patients' level as well as at the HC system level.

Another type of research tries to determine how HL can be improved and which variables affect HL. Studies have shown that HL is extremely low among elder persons and that they have problems using and understanding information related to their health condition (Kirsch et al., 1993; Baker et al., 2007; Weiss, Reed and Kligman, 1995; Williams et al., 2002; Kutner et al., 2005; Safeer and Keenan 2005; Sudore et al., 2006). In some researches (National Center for Education Statistics, 2006; Weiss, Reed and Kligman, 1995) the level of income is also related to the level of HL. People with low income and living below the poverty level showed lower HL than people living above the poverty level. Many studies found that there is a relation between gender and HL - women had higher HL than men (Sudore et al., 2006). Taking into account the geographical element, research showed that HL is lower in rural areas than in urban areas (Zahnd, Scaife and Francis, 2009) as well as among people who suffer from chronic illness (Schillinger et al., 2002).

In the report *Healthy People (2010)* of the US Department of Health and Human Services, the connections between poor education, low literacy, poor health and early death were emphasized. Education, health and HL are interlaced among themselves. Higher levels of education might be promoting better HL and health knowledge (Mirowsky, Ross, 1998; Ross, Mirowsky, 1999). Education is also an important variable in HL cost containment because educated individuals will be able to better understand the relevant information which would help them to make better health decisions (Kirsch et al., 1993; Baker, 2006; McCormack et al., 2010).

In 2012, an important research on HL was carried out in Europe. The European Health Literacy Survey compared HL in selected eight EU member states by measuring “how people access, understand, appraise and apply information to make decisions in terms of HC, disease prevention and health promotion”. The research identified and studied the impact of five significant and important social determinants listed in descending order by importance: financial deprivation, self-assessed social status, level of education, age, and gender. Although these selected variables showed significance, their impact varies from country to country, the results indicated higher average HL among young people, people with low financial deprivation, higher self-assessed social status and higher levels of education, and also in woman. The results implied that almost 50% of the people are at the risk of inadequate HL which is especially pronounced in certain groups where the risk exceeds 60%. However, variable significance varies depending on the country, so it is advisable to expand the research to other European countries. (HLS - EU consortium, 2012).

### **C. Health literacy tests**

One of the most frequently used comprehensive tests to measure the individual level of HL is the Test of Functional Health Literacy in Adults (TOFHLA). Following the continuous need for shorter tests, a shorter version of TOFHLA was developed – the S-TOFHLA (Baker et al., 1999). The latter instrument is used in this research because, despite shortness, it provides a complete assessment of functional HL as it was proved by numerous empirical researches. Following the number of points (from 0 to 100) achieved on the S-TOFHLA test, respondents are divided into three levels of HL: inadequate (0-53 points), marginal (54-66 points) and adequate (67-100 points). S-TOFHLA was originally developed in the USA and translated into a limited number of different languages. Therefore, for the purpose of this research, S-TOFHLA was translated into Croatian. Because of certain differences of language and HC systems between USA and Croatia, and upon consultations with experts in the fields of economics, medicine, language and sociology, the S-TOFHLA test underwent some adjustments.

## **III. RESEARCH RESULTS AND DISCUSSION**

The S-TOFHLA questionnaire was distributed between two locations of the Clinical Hospital Centre Rijeka - Rijeka and Sušak, Croatia (520 respondents). The survey was conducted during March and April 2013. Individuals under 18 of age or lacking cooperation or being too ill to participate were excluded from the evaluation. Respondent characteristics and descriptive statistics based on S-TOFHLA are given in table 1.

**TABLE 1 – RESPONDENT CHARACTERISTICS AND S–TOFHLA DESCRIPTIVE STATISTICS**

	<i>n</i> (%)	<i>S-TOFHLA</i>	
		<i>Mean</i>	<i>St. dev.</i>
Gender			
Male	203 (39.0)	75.78	25.023
Female	317 (61.0)	82.32	18.988
Age, categories			
Below 45	246 (47.3)	86.88	11.831
45-64	216 (41,5)	78.86	22.182
65 and above	58 (11,2)	52.91	29.964
Education level			
Primary and without education	46 (8,8)	52.93	29.932
Secondary education	287 (55,2)	79.39	20.196
Tertiary education	187 (36,0)	86.91	15.729
Place of residence			
City and its broader surroundings	459 (88,3)	80.44	21.701
Rural areas and islands	61 (11,7)	74.61	21.670
Net income			
No net income (0)	67(12,9)	85.21	11.838
< 2 200 HRK	78(15,0)	69.72	24.877
2 201 - 3 600 HRK	102(19,6)	69.05	27.697
3 601 - 8 800 HRK	226(43,5)	85.25	16.718
8 801 - 10 800 HRK	28(5,4)	90.07	17.782
> 10 800 HRK	16(3,1)	78.81	22.950
Chronic illness			
Yes	153(29,4)	70.25	27.183
No	354(68,1)	84.15	17.087

Source: Research results

The overall HL results showed that 82.4% of the respondents have adequate level of HL, 3.6% have marginal level of HL and 14% have inadequate level of HL. Keeping in mind that the Primorsko-Goranska County and especially the City of Rijeka have leading socio–economic and labor market indicators (ASOO, 2011) in Croatia, it can be argued that the score limits for the categories of HL might not be too appropriate for the surveyed location. Therefore, statistical tests were carried out and the results were reported on interval (test result) scale rather than on nominal scale (three HL categories). From the point of statistical testing, the interval scale was justified

by the use one-way ANOVA tests which are more robust than the Kruskal-Wallis (K-W) tests when heteroscedasticity is present in the data.

As pointed out within the research objectives, several (patients' personal, socio-economic, socio-demographic) factors (age, education, net income, employment, location of residence, gender, chronic illness) have been taken into account and their relationships with HL level were empirically tested. To establish which personal, socio-economic and socio-demographic characteristics influence the level of HL series one-way ANOVA tests were performed. As overall HL test results data represent a non-normal distribution with negatively skewed data (-1.835, Std. Error .107), reflected logarithmic transformation of the data was conducted which led to more normally distributed data with skewness lower than 1 (-0.474, Std. Error .107) upon which it was possible to utilize the robust ANOVA testing. Another argument in favor of reflected transformation of the data is that the factors' group variances were less different from each other.

The influence of age was tested after respondents have been divided into three groups (respondents under 45 years of age, between 45 and 64 years and above 65 years of age). A one-way ANOVA was used to test for HL test results differences among three different age groups. HL test results differed significantly across the three age groups [ $F(2,517) = 41.468, p = .000, R^2 = .138$ ]. As the homogeneity of variance, assessed by Levene's Test for Equality of Variances, was violated, a Welch's t test which does not assume equal variances was carried out. Significant effect for age groups [ $t(176) = 60.153, p = .000$ ] was found. Post hoc comparison using the Games-Howell test indicated that the mean score between all age groups were significantly different at  $p < .05$  from each other. HL tests means ( $M_1 = 86.88, 95\% \text{ CI } [85.39, 88.36]$ ;  $M_2 = 78.86, 95\% \text{ CI } [75.88, 81.83]$ ;  $M_3 = 52.91, 95\% \text{ CI } [45.04, 60.79]$ ) indicate that HL test results decrease with age.

Because heteroscedasticity was present in the data as well as was substantial difference in sample size of three age categories ( $n_1 = 248; n_2 = 216; n_3 = 58$ ) data were randomly resampled into a three categories of  $n = 58$  in order to check the robustness of the results. Equalizing the sample size have assured the homogeneity of variance, assessed by Levene's Test for Equality of Variances at  $p > .05$ , and made the ANOVA procedure more robust [ $F(2, 171) = 41.468, p = .000$ ]. However, Tukey post-hoc comparisons of the respondents under 45 years of age and respondents between 45 and 64 years of age were not statistically significant at  $p < .05$ . This means that HL test results are statistically different only between respondents younger than 45 and older than 65 years of age at  $p < .05$ .

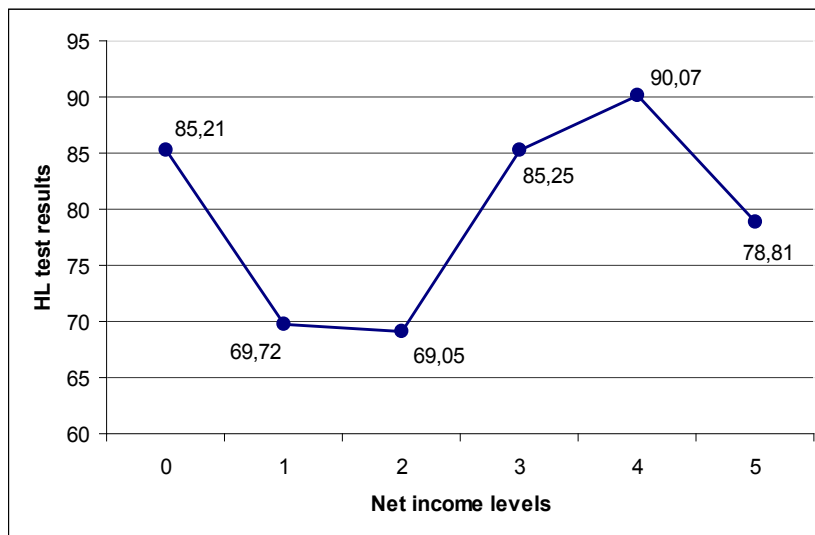
Further on, one-way ANOVA was used to test for HL test results differences among three different levels of education - "primary education or less", "secondary education" and "tertiary education". There was a significant effect of level of education on HL test results after ANOVA test was performed [ $F(2, 517) = 43.369, p = .000, R^2 = .144$ ] even after assumption of the unequal variance using the Welch's t test ( $t(129) = 47.364, p = .000$ ). Additional post hoc Games-Howell tests with no equal variance assumed was performed indicating that the test results differ significantly among all levels of education with  $p < .05$ . It can be concluded that the level of HL is increasing with the level of education ( $M_1 = 52.93, 95\% \text{ CI } [44.05, 61.82]$ ;  $M_2 = 79.39, 95\% \text{ CI } [77.05, 81.75]$ ;  $M_3 = 86.91, 95\% \text{ CI } [84.65, 89.18]$ ) which supports previous empirical research results (Baker, 2006; McCormack et. al. 2010).

Again, like in the case of age, heteroscedasticity was present in the data as well as a substantial difference in sample size of three different levels of education ( $n_1 = 46; n_2 = 287; n_3 = 187$ ). Data were randomly resampled into a three categories of  $n = 46$  in order to check the robustness of the statistical test results. Only difference from the previous unequal sample size testing was



that post hoc Games-Howell test did not find significant difference between respondents with "secondary education" and respondents with "tertiary education" at  $p < .05$ .

After taking a Welch's t test ( $t(93) = 17.220$ ,  $p = .000$ ,  $R^2 = .142$ ), analysis showed that HL test results differ significantly among different levels of monthly net income. The monthly net income was divided into five interval levels (1 – lowest; 5 – highest) with addition of respondents without net income. Additional Games-Howell post-hoc testing explained the differences in HL results by the different income level groups. Interestingly, respondents without net income had greater mean ( $M = 85.21$ , 95% CI [82.32, 88.10]) than respondents from the first income level group ( $M = 69.72$ , 95% CI [64.11, 75.33]) at  $p < .05$ . An explanation can be found in the present economic crisis which led to a high unemployment rate among young educated people. Also, the first income level group mostly includes elderly respondents earning low pensions. First group also showed to be significantly different than the third ( $M = 85.25$ , 95% CI [83.06, 87.44]) and the fourth group ( $M = 90.07$ , 95% CI [83.18, 96.97]) at  $p < .05$ . The second income level group ( $M = 69.05$ , 95% CI [63.61, 74.49]) was found to be statistically different from the third and the fourth income group as well as from the respondents without net income. Statistical analysis did not confirm statistically significant difference between the fourth and the fifth ( $M = 78.81$ , 95% CI [66.58, 91.04]) as well as between the respondents without net income and the fifth income level groups at  $p < .05$ . HL test means for different income levels are given in graph 1.



GRAPH 1 - HL TEST MEANS FOR DIFFERENT INCOME LEVELS

Source: Author's calculation

With respect to the location of residence, respondents were divided into two groups (respondents from the City of Rijeka and its broader surroundings and those from rural areas and islands). Homogeneity of variance, assessed by Levene's Test for Equality of Variances, was not violated at  $p > .05$  and the ANOVA test indicated that the HL test results differ significantly by the location of residence [ $F(1, 518) = 8.358$ ,  $p = .004$ ]. The group means ( $M_1 = 80.44$ ;  $M_2 = 74.61$ ) indicate that respondents from the City of Rijeka and its broader surroundings have better HL than respondents from rural areas and islands. These findings are in accordance with previous empirical research (Zahnd, Scaife and Francis, 2009).

Also, the ANOVA test indicates that the variability in HL test results can be explained by gender [ $F(1, 518) = 9.328, p = .002$ ] which are slightly better for females ( $M = 82.31, 95\% \text{ CI } [80.21, 84.40]$ ) than males ( $M = 75.78, 95\% \text{ CI } [72.32, 79.24]$ ).

Welch's t test results [ $t(253) = 23.712, p = .000$ ] confirmed that the HL test results are significantly different between respondents with and without chronic illness, indicating that respondents without chronic illness achieve better results ( $M = 84.15, 95\% \text{ CI } [82.36, 85.94]$ ) than respondents with chronic illness ( $M = 70.25, 95\% \text{ CI } [65.91, 74.60]$ ).

After the relationships between HL results and patients' personal, socio-economic and socio-demographic variables were tested, the research goal (supported by previous empirical research and theoretical findings) was to determine if there is a relationship between level of HL and HC system characteristics (accessibility of the public HC services). Therefore, five steps were set to measure the level of easiness in:

1. receiving professional advice and reference by physician (general practitioner GP) (T1);
2. finding health facilities (T2);
3. understanding medical diagnosis (T3);
4. understanding instructions on taking medicament(s) (T4);
5. receiving second opinion from another physician (T5).

Some empirical findings suggest that reliable access to HC is significantly associated with level of HL (Vernon et al., 2007). The accessibility of public HC services is not only determined by personal characteristics, but also by characteristics of the HC system (Figure 1).

One-way ANOVA tests were conducted to determine if different levels (Lickert scale measure) of patients' perception of accessibility of the public HC services (T1-T5) could explain the variability of the HL test results. Statistical findings are given in table 2.

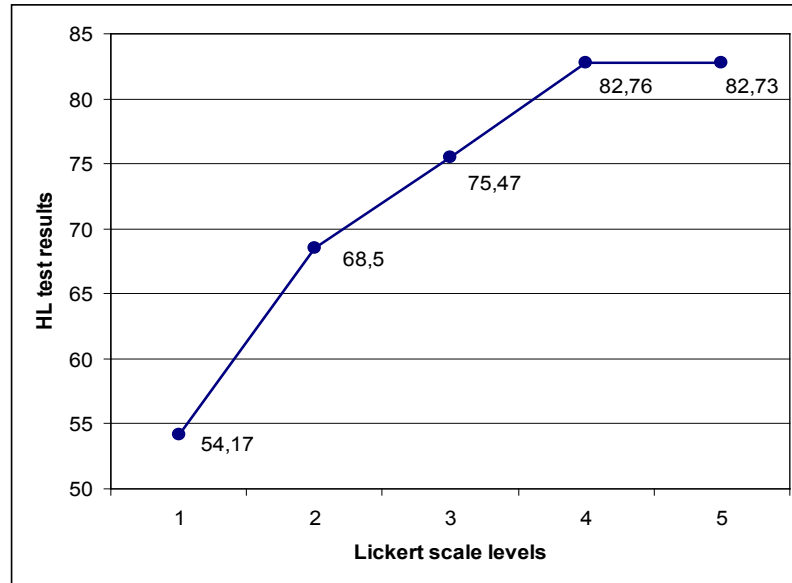
**TABLE 2 - ANOVA RESULTS FOR THE PERCEPTION OF ACCESSIBILITY AND THE HL TEST RESULTS**

<i>Variable</i>	<i>ANOVA F</i>	<i>P value</i>
T1	$F(4, 500) = 2.814$	$p = .025$
T2	$F(4, 489) = 2.020$	$p = .090$
T3	$F(4, 488) = 2.030$	$p = .085$
T4	$F(4, 493) = 4.485$	$p = .001$
T5	$F(4, 488) = 2.020$	$p = .000$

Source: Research results

Because all the variables (T1-T5) had  $p < .05$  on Levene's Test for Equality of Variances, the results of ANOVA F tests are presented in the above table. There was a significant effect of T1, T4 and T5 on the HL test results at the  $p < .05$ . However, post hoc comparison using the Tukey's test indicated that all mean scores for different levels of T1 were not significantly different from each other at  $p < .05$ . Also, for variable T5 Tukey's test indicated that significant difference could only be found between the first ( $M = 73.90, 95\% \text{ CI } [66.6, 81.19]$ ) and the second ( $M = 85.82, 95\% \text{ CI } [82.22, 89.42]$ ) level of T5. But more importantly, the test means did not indicate any constant directions.

Post hoc comparison using Tukey's test suggested that significant difference can be found between the first ( $M = 54.17$ , 95% CI [34.07, 74.07]) and the fourth ( $M = 82.76$ , 95% CI [80.26, 85.25]) Lickert scale level as well as between the first and the fifth ( $M = 75.78$ , 95% CI [72.32, 79.24]) level of T4 at  $p < .05$ . The means for T4 are given in graph 2.



**GRAPH 2 - HL TEST MEANS FOR DIFFERENT LEVELS OF UNDERSTANDING INSTRUCTIONS ON TAKING MEDICAMENT(S) (T4)**

Source: Author's calculation

These findings can logically be interpreted when observed in the context of the Croatian socio-economic conditions and the HC system. Namely, when observing the level means of T5 (receiving a second opinion from another physician) and their changing direction, the explanation can be found in varying physicians' willingness to refer patients for a second opinion and also in the patients' scarce knowledge of their rights. The most interesting and the most economically valid results here refer to the suggestion that the variability in HL test results can be associated with the respondents' perceived easiness in understanding instructions on taking medicament(s).

Furthermore binary logistic regression model was used to investigate the effect of the above mentioned variables on the probability of achieving adequate level of HL. Assuming that variables have independent influence on HL test results, the following model was estimated.

$$Y = \beta_0 + \beta_1 \text{AGE} + \beta_2 \text{FEMALE} + \beta_3 \text{SEC.EDU} + \beta_4 \text{TERT.EDU} + \beta_5 \text{RURAR} + \beta_6 \text{NET2} + \beta_7 \text{NET3} + \beta_8 \text{NET4} + \beta_9 \text{NET5} + \beta_{10} \text{T4} + \beta_{11} \text{T5} \quad (1)$$

Where Y is the probability of adequate HL test results and variables AGE, T4 and T5 represent continuous variables opposed to gender, level of education, place of residence and net monthly income that are categorical variables with categories male, primary education, city and surroundings and the first net income level being reference cases respectively.

After conducting a binary logistic regression estimated model is given by the following equation.

$$Y = 1,604 + .072AGE + .670FEMALE + 1.217SEC.EDU + 1.341TERT.EDU - 1,193 RURAR + 1.203NET3 + 2.22NET4 + .494T4 - .329T5 \quad (2)$$

Hosmer and Lemeshow statistics has significance at  $p = .737$  which means that it is not statistically significant and therefore the model presents a good fit. All the signs have the expected values according to the previous ANOVA statistics. In short, OR values indicate that the probability of adequate HL measured by S-TOFHLA was significantly higher among younger respondents, females, respondents having at least secondary education, respondents earning more than 3.600 HRK a month and respondents who have better understanding in taking medicaments. The highest influence, with regard to baseline categories, can be found in the variables “level of education” and “net income”. Controlling for other variables, the model indicates that respondents with secondary and tertiary education are almost 4 times more likely to have adequate HL test results than respondents with primary education. Also, it is indicative that, controlling for other variables, respondents with a monthly net income over 3.600 HRK are 3.3 up to 9.3 times more likely to have adequate HL test results than respondents earning less than 2.200 HRK monthly. Odds ratios (OR) are given in table 3.

**TABLE 3 – ODDS RATIOS OF THE FACTORS ASSOCIATED WITH HL**

<i>Variable</i>	<i>OR</i>	<i>95%CI</i>	<i>p</i>
AGE	0.931	0.908-0.954	0.000
FEMALE	1.954	1.046-3.650	0.036
SEC.EDU	3.378	1.369-8.337	0.008
TERT.EDU	3.822	1.306-11.185	0.014
RURAR	0.302	0.125-0.733	0.008
NET3	3.331	1.429-7.768	0.005
NET4	9.292	1.012-85.278	0.049
T4	1.639	1.133-2.373	0.009
T5	0.719	0.547-0.956	0.018

Source: Research results

Finally, it was tested if the HL level could explain the differences in the perceived level of easiness of patients’ orientation within the HC system (given by abovementioned 5 steps) which play important role in efficient and effective HC utilization. For this purpose nonparametric equivalent of one-way ANOVA - which allows for the comparison of more than two independent groups - the Kruskal-Wallis (K-W) test was used.

The K-W test showed that the three levels of HL (adequate, marginal and inadequate) could explain the differences in the variance of understanding instructions on taking medicament(s) T4 ( $H(2) = 6.495, p = .039$ ). Levene’s test of homogeneity of variance at  $p = .585$  justified the use of K-W test. These statistical findings confirm the existence of a relationship between level of HL and medicaments costs, which comprise a significant share in the public HC spending which confirm

the previous research on the influence of low levels of HL on the increasing costs of medical care (Vernon et al., 2007; Weiss and Palmer, 2004; Friedland, 2002).

In Croatia (HZZO, 2013), the costs of the HC system have increased by more than 5% in 2012 relatively to the previous year's costs. The total costs of medicaments amount to about 1.5% of the GDP and are constantly increasing through the years. Compared to 2011, medicaments on prescription have increased by more than 9% in 2012 and their share in the total costs of the HC structure is 18.22%. Particularly expensive medicaments increased by more than 7% in 2012 with respect to the previous year and they represent 3.13% of the total costs of the HC structure. Most of these costs are subsidized by the public HC system and they represent a significant burden to the public spending. Therefore, a rational and efficient use of medicaments is crucial in order to reduce the costs and to redirect the excessive funds into more needful domains which are very important in the context of aging population and increasing prevalence of chronic illness. Additionally, post-hoc testing confirmed that the mean ranks of the T4 are significantly different from each other only between the categories of adequate HL ( $H(2) = 4.875, p = .027$ ) and inadequate HL ( $H(2) = 4.848, p = .028$ ). HL test means indicates that respondents with adequate level of HL ( $M = 4.32, 95\% \text{ CI } [4.25, 4.39]$ ) have better understanding of instructions on taking medicaments than respondents with inadequate level of HL ( $M = 3.93, 95\% \text{ CI } [72.32, 79.24]$ ).

#### IV. CONCLUSION

Inadequate HL is shown to be one of the main cost generators within national HC systems. A lot of researches have emphasized the influence of HL on health related issues with less attention given to the economic effects. The contribution of this paper, besides the empirical research, is in the explanation of the connection between agency costs in HC with inadequate HL. In the HC market there is prominent agency problem due to information asymmetry between users and providers of HC which is accentuated by the inadequate level of HL. Patients should be adequately informed and should possess skills and abilities to understand and process given information in order to make appropriate and efficient utilization of HC services.

HC is not a purely economic good and it is a matter of public policy and administrative decision making. Governments should be familiar with the factors that influence the population level of HL and therefore the research on HL is significant for the HC policy. Since a similar research has not been carried out previously in Croatia, this research fills the gaps of an inadequately studied topic. Its main research findings indicate that higher HL is associated with younger respondents, females, respondents with at least secondary education, respondents earning more than 3.600 HRK per month and respondents who have better understanding in taking medicaments. Also, findings indicate that the level of HL could influence the cost-efficient use of medicaments which represent a significant burden to the public HC spending.

HL generates different economic effects on the healthcare system and influences the implementation of the public healthcare policies. For that reason, the research on the factors influencing the populations' HL directly contributes to better understand the economic effects of HL. Future research should be focused on quantifying the costs and the savings of HL in Croatia.

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