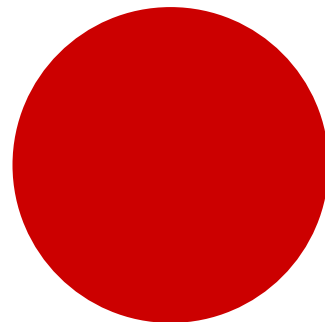
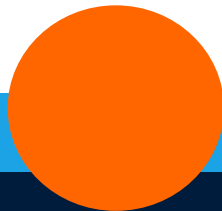


COMPARATIVE REPORT ON HEALTH LITERACY IN EIGHT EU MEMBER STATES



The European Health Literacy Project 2009-2012



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National Institute
for Public Health and
the Environment

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APPENDIX OF THE COMPARATIVE REPORT OF HEALTH LITERACY IN EIGHT EU MEMBER STATES. THE EUROPEAN HEALTH LITERACY SURVEY HLS-EU , ONLINE PUBLICATION: [HTTP://WWW.HEALTH-LITERACY.EU](http://www.health-literacy.eu)

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1 Executive Summary

Key Characteristics of the Survey

The European Health Literacy Survey (HLS-EU) was conducted during the summer of 2011 across eight European countries (Austria, Bulgaria, Germany (North Rhine-Westphalia), Greece, Ireland, Netherlands, Poland, and Spain). In each country, a random sample of approximately 1000 EU-citizens, 15 years and older was interviewed yielding a total sample of approximately 8000 respondents. TNS Opinion on behalf of the HLS-EU consortium collected the data, applying Eurobarometer standards in methodology and sampling procedures. Data were collected face to face via a standardized questionnaire, using a Computer Assisted Personal Interviewing (CAPI) mode in all countries except for Bulgaria and Ireland, where Paper Assisted Personal Interview (PAPI) was used.

Characteristics of the Health Literacy Measurement Instrument HLS-EU-Q

To measure health literacy, the instrument labelled HLS-EU-Q was derived from the conceptual model and definition developed by the HLS-EU consortium¹. The conceptual model integrates three health relevant areas (health care, disease prevention, health promotion) and four information processing stages (access, understand, appraise, apply) related to health relevant decision-making and tasks. These areas and stages combined create a matrix measuring health literacy (HL) with 12 sub-dimensions, which were operationalized by 47 items. The 47 items were assessed using a 4-point self-report scale (very easy, easy, difficult, very difficult) to measure the perceived difficulty of selected health relevant tasks. Therefore the HLS-EU-Q refers to self-perceived measure of HL and reflects interactions between individual competences and situational complexities or demands. This should to be taken into account, when interpreting the survey results, and especially when comparing these results between the participating countries.

¹ Sorensen, K. 2012: Health literacy and public health: A systematic review and integration of definitions and models, BMC Public Health, 12(80).

Results for Single Items

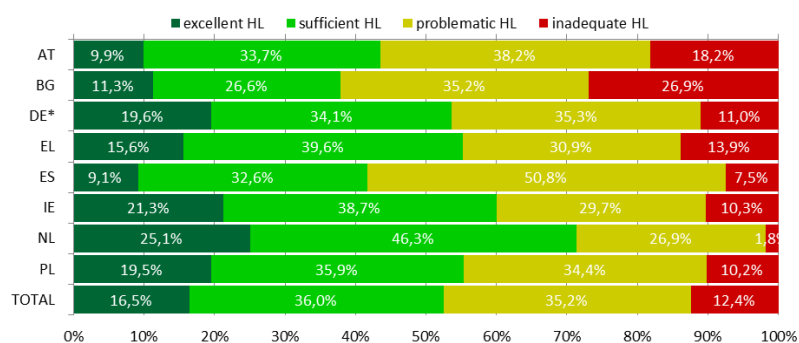
Although the single items produce considerable different response patterns depending on the kind of item and the sampled country, all are positively associated between each other. Items measuring the difficulty of - following instructions from health professionals - were generally perceived as the easiest of the instrument. Most respondents find it easier to follow instructions than to make their own decisions or judgments. The most difficult tasks are: comprehending how political decisions affect one's health, judging the credibility of health information from the media or deciding between different treatment options.

Construction of Health Literacy Indices

Following the HLS-EU concept different sub-indices based on the mean values of the HL-items were constructed, primarily indices for the three areas of HL: health care (16 items), disease prevention (16 items) and health promotion (15 items), alongside a general health index comprising all 47 items was calculated. These indices were standardized on a unified metric with a minimum of 0 and a maximum of 50, where 0 represents the least possible health literacy and 50 represents the best possible one. The general health literacy index is highly correlated with the sub-indices which are also correlated among themselves. The mean values of the indices differ slightly, being somewhat higher for health care HL and disease prevention HL than for health promotion HL. The mean values differ more pronounced by country, than by type of index. Therefore, to reduce complexity, the main body of analysis in this report uses the general health literacy index (general-HL), and selected results for the three sub-indices are included in the appendix.

Prevalence of Limited Health Literacy

For the four indices (general, healthcare, disease prevention, health promotion) threshold values were set, dividing the scores into 4 categories: 'inadequate', 'problematic', 'sufficient' and 'excellent' health literacy.



About 12% of respondents have inadequate general health literacy, and more than one third (35%) problematic health literacy, thus nearly every second respondent shows limited health literacy,

in the general sample. Therefore limited health literacy in Europe is not just a minority problem. But the percentages for the 4 categories of the general-HL vary considerably between the participating countries, for inadequate HL between 2% and 27% respectively for limited (inadequate + problematic) HL between 29% and 62%. Thus differences within Europe are large and have to be taken into account adequately, when formulating health literacy policies.

Results for NVS-Test

The well-established New Vital Sign test, an objective measurement of functional or basic health literacy, was included into the survey for reasons of validation and comparison. As far as proportions of limited health literacy are concerned this test gives rather similar results as the general HL index. The NVS-Test shows that 21% of respondents in the total sample have a high likelihood of limited literacy, and the share of respondents with either high or possibly limited literacy amount to 45%. These proportions also vary considerably by country. The correlation of the NVS Test with general HL is significant, positive and with $r = .25$ of remarkable amount. It is in the same range as the correlations between the socio-demographic or socio-economic indicators and general HL, e.g. education with $r = .24$. The NVS as a standardized measure for basic functional health literacy therefore only explains a moderate amount of variation of the HLS-EU's general HL index, indicating the importance of other individual and situational factors and consequently the relational or contextual character of the HLS-EU-Q.

Selected Social Determinants of General Health Literacy

A number of possible social determinants of health literacy, which have already been discussed in the literature and illustrated in the HLS-EU conceptual model, are included in the HLS-EU study. Bivariate examination (for the total sample) identified significant and important social determinants – listed in descending order: financial deprivation ($r = .3$), self-assessed social status ($r = .29$), level of education ($r = .24$), age ($r = -.12$), and gender ($r = .05$), while parental status of migration showed no significant correlation with health literacy (in a sample population of only EU-citizens!). Thus the average health literacy is higher for young individuals with low financial deprivation, for individuals with higher self-assessed social status and higher levels of education, as well as for women. These correlations vary by country, e.g. for financial deprivation between $r = -.13$ and $r = -.42$.

In a multivariate examination 5 significant social determinants of health literacy explain 17% of the variation of general health literacy in the total sample. This is somewhat less than the NVS-score (21%) or self-assessed health status (25%) explains, but nonetheless a remarkable social gradient. The order of importance of indicators does not change in multivariate perspective: financial deprivation ($\beta = -.24$), social status ($\beta = .14$), level of education ($\beta = .13$), age ($\beta = -.09$) and gender ($\beta = .06$). Again variation between countries is considerable, for the explained variance (between 8% and 29%) and also for strength of beta weights (e.g. for financial deprivation between $\beta = -.07$ and $\beta = -.35$).

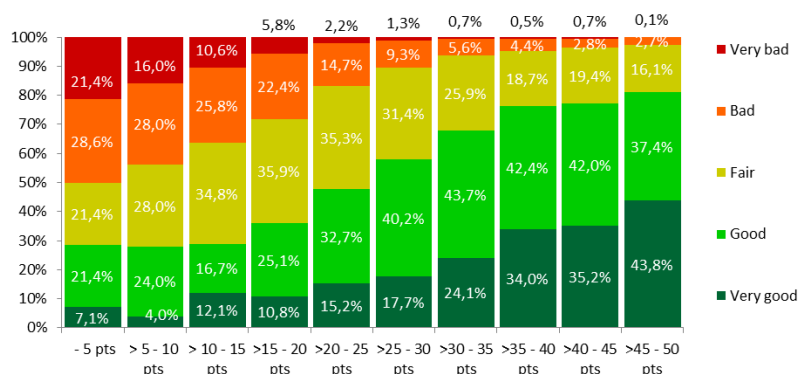
Consequences of Health Literacy for Selected Health Related Outcomes

In the literature on health literacy there is some debate about effects of health literacy on health related outcome measures. For three outcomes (health behaviour, health status, health service use) indicators have been measured in the HLS-EU study. For these the predictive value of health literacy was analysed.

Bivariate examination of health literacy with four *health behaviour and health risk* indicators, resulted in significant and remarkable associations with the frequency of physical activity ($r = -.19$), but just moderate to small associations with Body-Mass-Index ($r = -.07$) and alcohol consumption ($r = .07$). Health literacy (in the total sample) was not at all correlated with smoking behaviour. Associations vary and are partly inconsistent at national levels.

For indicators of *health status*, bivariate associations of health literacy in the total sample were much stronger, significant and strongest for self-assessed health ($r = -.27$), and somewhat less for limitations by health problems ($r = .16$) and long-term illness or health problems ($r = .16$).

The bivariate relationship between self-assessed health and health literacy shows that respondents with better health literacy feel healthier. The share of respondents stating 'good' or 'very good' health increases steadily from below 30% up to more than 80% for the highest general health literacy values.



In a multivariate model 8 predictors together explain 44% of total variance for self-assessed health in the total sample, general health literacy shows third highest effect ($\beta = -.13$), past long-term illness ($\beta = .44$) and age ($\beta = .18$). Again variation by country is considerable, for explained variances (between 30% and 63%) respectively for the β values of general health literacy (from $\beta = -.08$ to $\beta = -.17$). A significant relationship, associating higher health literacy, with better self-assessed health, can be demonstrated for all participating countries.

For the four surveyed indicators of *health service use*, bivariate correlations with general health literacy (in the total sample) are less pronounced: significant and strongest for frequency of doctor visits ($r = -.11$), and just half as strong for frequency of use of emergency services ($r = -.06$), or of hospital services ($r = -.06$) and reversed for use of other health professionals ($r = .06$). But even for frequency of doctor visits, the relationship vanishes, when examined in a multivariate model with 5 other predictors. Therefore, general health literacy seems to have no direct effect on frequency of health service use, but nevertheless, health services are confronted with over-proportional shares of patients with limited health literacy, due to other intervening correlations.

Specifically Vulnerable Groups with High Proportions of Limited General Health Literacy

The correlations of general health literacy with social determinants as well as with health related covariates identify specific vulnerable groups with an over proportional risks for limited health literacy. Respondents assessing their social status as very low or their health status as very bad or bad have a risk of more than 70% to have limited health literacy. Respondents with low education, financial difficulties, severe limitations by health problems, more than one long-term illness or an age over 75 have a risk of over 60% to have limited health literacy. Again shares of respondents with over-proportional risk of limited health literacy vary considerably for participating countries. Thus specific vulnerable groups in European countries have been identified, who may be in need of specific compensatory measures.

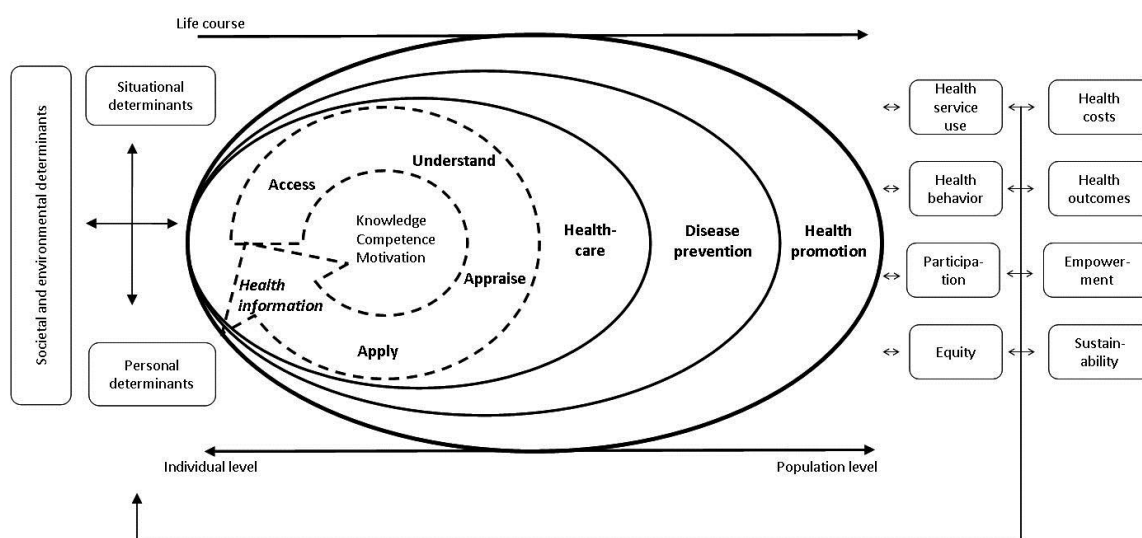
2 Measuring Health Literacy (HL) using the HLS-EU-Q

2.1 Definition and Conceptual Model of Health Literacy

The HLS-EU consortium developed a working definition and a conceptual model² (Figure 1) of health literacy:

Health literacy is linked to literacy and entails people's 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 during the life course³.

Figure 1: The HLS-EU Conceptual Model of Health Literacy (Sorensen et al. 2012)



² Sorensen, K. 2012: Health literacy and public health: A systematic review and integration of definitions and models, BMC Public Health, 12(80).

³ Sorensen, K. 2012: Health literacy and public health: A systematic review and integration of definitions and models, BMC Public Health, 12(80).

The conceptual model distinguishes between three domains of health literacy (HL), health care (HC-HL), disease prevention (DP-HL) and health promotion (HP-HL) and four modes of dealing with health relevant information: access/obtain, understand, appraise/judge/evaluate and apply/use. Combining the three domains and the four modes a 3*4 matrix with 12 cells emerges where each cell can be interpreted as one of 12 theory based sub-dimensions of health literacy (see Table 1).

Table 1: Matrix of Sub-dimensions of Health Literacy Based on the HLS-EU Conceptual Model (Sorensen et al. 2012), Used for Questionnaire Construction

| Health Literacy | Access/obtain information relevant to health | Understand information relevant to health | Appraise/judge/evaluate information relevant to health | Apply / use information relevant to health |
|--------------------|--|---|--|--|
| Health Care | 1) Ability to access information on medical or clinical issues | 2) Ability to understand medical information and derive meaning | 3) Ability to interpret and evaluate medical information | 4) Ability to make informed decisions on medical issues |
| Disease Prevention | 5) Ability to access information on risk factors | 6) Ability to understand information on risk factors and derive meaning | 7) Ability to interpret and evaluate information on risk factors | 8) Ability to judge the relevance of the information on risk factors |
| Health Promotion | 9) Ability to update oneself on health issues | 10) Ability to understand health related information and derive meaning | 11) Ability to interpret and evaluate information on health related issues | 12) Ability to form a reflected opinion on health issues |

2.2 The HLS-EU Items

For comparing and interpreting the following data certain characteristics of sampling have to be kept in mind: All samples were created according to the Eurobarometer methodology which only includes EU citizens. Populations of non-EU migrants were excluded. In Germany, North-Rhine Westphalia was the only state that participated in the study. Thus German results are only valid for this region and may in some cases not be generalizable beyond North-Rhine Westphalia. The Greek survey was sampled exclusively in Athens and its surrounding areas. In most countries the data was collected by Computer Assisted Personal Interview (CAPI), only in Bulgaria and Ireland the Paper Assisted Personal Interviewing (PAPI) mode was used. For reasons of validation and comparison, the survey also included a direct ability testing instrument; the Newest Vital Sign test (NVS)⁴.

⁴ Weiss et al. 2005: Quick Assessment of Literacy in Primary Care: The Newest Vital Sign, *Annals of Family Medicine* 514-522, 3(6).

The 12 theoretical sub-dimensions were regarded to be of equal relevance for measuring general health literacy and each sub-dimension is represented by 3-5 items, resulting in an instrument of 47 items⁵. Items were either selected from existing instruments, newly formulated or developed by the consortium. The items were phrased as direct questions (not statements): 'On a scale from very easy to very difficult, how easy would you say it is to ...' perform a given health related task. Respondents rated their perceived difficulty on a Likert scale with 4 points (very easy, easy, difficult, very difficult). An unsupported possibility was available for not answering the question, which was not offered by the interviewer but coded if the question was not answered.

This chosen format of items has to be taken into account for interpreting differences in measured results. The items of the HLS-EU-Q measure self-experienced and self-rated abilities to perform health relevant tasks of information management. The instrument does not just measures individual abilities or skills but the self-experienced and self-rated relation or fit of personal competencies and situational demands/complexity⁶. Thus, the measure reflects self-evaluated health literacy competencies of populations in relation to health literacy demands of specific national situations. A low level of HL in a certain country can be interpreted in different ways, either the country's population has specifically low competencies, or the health system is characterized by specifically high demands, or a mixture of both. Furthermore, when interpreting results, group differences may also be influenced by the extent of actual experience of a given task, or by different rating tendencies (to rather understate or overstate difficulties) and by different expectations concerning difficulties of tasks.

⁵ For a more detailed description of item selection and testing see Sorensen, K. 2012: Health literacy and public health: A systematic review and integration of definitions and models. BMC Public Health, 12(80).

⁶ Parker, R. Measuring Health Literacy: What? So What? Now What? In: Hernandez L. 2009. Measures of Health Literacy: Workshop Summary Roundtable on Health Literacy. Institute of Medicine, p.92, <http://www.nap.edu/catalog/12690.html> (accessed 10/01/2010).

2.3 Answer Distributions of Health Literacy Items for Countries and Total

The wordings of the 47 items and the empirical answer patterns for the total sample of the 8 countries are shown in Table 2. To increase the representativeness, national samples were weighted by gender, age group and size of locality, based on national census data. Country size was not a weighting criterion for the total sample. Answer distributions of the total sample consequently don't represent the European average but a non-weighted 'country average' for the participating European countries.

Column 5 displays the 'don't know' category for all items proving that the majority of items were answered by at least 95% of the total sample. Only 6 items had higher non-response rates (Q 1.28 = 5.4%; Q 1.18 = 5.6 %; Q 1.34 = 6.2 %; Q 1.12 = 6.3 %; Q 1.47 = 6.9%; Q 1.35 = 7.7 %). Due to its workplace related content ('to find out about efforts to promote your health at work') item Q 1.35 was, with a non-response rate of 17.1%, an extreme outlier. Of the remaining five items with more than 5% missing values only one is part of the health care battery, two of the disease prevention battery and four were related to health promotion. Based on these results, all items were kept for further analysis.

The percentage distributions on the difficulty-easiness scale demonstrates that there is considerable variation in item difficulty, ranging from 13.4% (Q 1.12) for 'very easy' to 56.1% (Q 1.15), and from 0.7% (Q1.16) to 18.0% (Q 1.35) for 'very difficult'. The (in average) considerably smaller percentages in the 'very difficult' category indicate that the item battery is somewhat more sensitive for respondents with lower health literacy (see Table 2).

Table 2: Percentage of All HLS-EU-Q Health Literacy Matrix Items for Total (N= 8102)

| Item | On a scale from very easy to very difficult, how easy would you say it is to: ... | 1 very difficult | 2 fairly difficult | 3 fairly easy | 4 very easy | 5 don't know |
|-------|---|------------------------|--------------------------|---------------------|-------------------|--------------------|
| Q1.1 | find information about symptoms of illnesses that concern you? | 4.7% | 17.4% | 45.9% | 29.0% | 3.0% |
| Q1.2 | find information on treatments of illnesses that concern you? | 5.0% | 20.9% | 46.3% | 24.1% | 3.7% |
| Q1.3 | find out what to do in case of a medical emergency? | 3.8% | 17.6% | 45.2% | 31.3% | 2.2% |
| Q1.4 | find out where to get professional help when you are ill? | 2.2% | 9.6% | 46.6% | 40.7% | 0.9% |
| Q1.5 | understand what your doctor says to you? | 2.2% | 13.0% | 46.5% | 37.4% | 0.9% |
| Q1.6 | understand the leaflets that come with your medicine? | 6.8% | 20.7% | 42.6% | 28.0% | 2.0% |
| Q1.7 | understand what to do in a medical emergency? | 3.3% | 18.0% | 46.7% | 30.0% | 2.0% |
| Q1.8 | understand your doctor's or pharmacist's instruction on how to take a prescribed medicine? | 0.9% | 5.6% | 46.0% | 46.9% | 0.7% |
| Q1.9 | judge how information from your doctor applies to you? | 2.3% | 15.3% | 52.0% | 27.8% | 2.6% |
| Q1.10 | judge the advantages and disadvantages of different treatment options? | 8.2% | 32.7% | 39.5% | 15.7% | 4.0% |
| Q1.11 | judge when you may need to get a second opinion from another doctor? | 7.2% | 29.5% | 39.5% | 19.1% | 4.7% |
| Q1.12 | judge if the information about illness in the media is reliable? | 10.9% | 35.7% | 33.7% | 13.4% | 6.3% |
| Q1.13 | use information the doctor gives you to make decisions about your illness? | 3.0% | 19.3% | 50.9% | 23.4% | 3.4% |
| Q1.14 | follow the instructions on medication? | 1.1% | 5.7% | 44.6% | 48.0% | 0.6% |
| Q1.15 | call an ambulance in an emergency? | 1.9% | 6.8% | 34.3% | 56.1% | 1.0% |
| Q1.16 | follow instructions from your doctor or pharmacist? | 0.7% | 4.9% | 43.2% | 50.8% | 0.4% |
| Q1.17 | find information about how to manage unhealthy behaviour such as smoking, low physical activity and drinking too much? | 2.5% | 11.7% | 43.7% | 39.1% | 3.0% |
| Q1.18 | find information on how to manage mental health problems like stress or depression? | 7.1% | 24.5% | 40.0% | 22.8% | 5.6% |
| Q1.19 | find information about vaccinations and health screenings that you should have? | 4.3% | 18.9% | 44.8% | 28.9% | 3.2% |
| Q1.20 | find information on how to prevent or manage conditions like being overweight, high blood pressure or high cholesterol? | 2.7% | 14.9% | 47.6% | 32.3% | 2.6% |
| Q1.21 | understand health warnings about behaviour such as smoking, low physical activity and drinking too much? | 1.8% | 8.4% | 46.5% | 41.8% | 1.6% |
| Q1.22 | understand why you need vaccinations? | 3.2% | 13.1% | 44.8% | 36.9% | 2.0% |
| Q1.23 | understand why you need health screenings? | 1.4% | 8.7% | 45.7% | 42.5% | 1.6% |
| Q1.24 | judge how reliable health warnings are, such as smoking, low physical activity and drinking too much? | 2.3% | 11.7% | 49.1% | 34.8% | 2.0% |
| Q1.25 | judge when you need to go to a doctor for a check-up? | 2.0% | 14.1% | 47.7% | 35.1% | 1.2% |
| Q1.26 | judge which vaccinations you may need? | 6.3% | 25.3% | 40.3% | 24.7% | 3.5% |
| Q1.27 | judge which health screenings you should have? | 3.7% | 20.7% | 44.4% | 28.4% | 2.9% |
| Q1.28 | judge if the information on health risks in the media is reliable? | 7.9% | 31.9% | 38.8% | 15.9% | 5.4% |
| Q1.29 | decide if you should have a flu vaccination? | 5.6% | 19.8% | 40.6% | 30.8% | 3.2% |
| Q1.30 | decide how you can protect yourself from illness based on advice from family and friends? | 3.6% | 17.9% | 49.5% | 25.8% | 3.3% |
| Q1.31 | decide how you can protect yourself from illness based on information in the media? | 6.6% | 28.8% | 42.1% | 18.4% | 4.1% |
| Q1.32 | find information on healthy activities such as exercise, healthy food and nutrition? | 2.6% | 11.5% | 46.2% | 38.1% | 1.7% |
| Q1.33 | find out about activities that are good for your mental well-being? | 4.8% | 16.9% | 44.1% | 30.2% | 3.9% |
| Q1.34 | find information on how your neighbourhood could be more health-friendly? | 10.8% | 27.0% | 37.3% | 18.7% | 6.2% |
| Q1.35 | find out about political changes that may affect health? | 18.0% | 31.1% | 29.6% | 13.6% | 7.7% |
| Q1.36 | find out about efforts to promote your health at work? | 7.9% | 20.9% | 35.9% | 18.2% | 17.1% |
| Q1.37 | understand advice on health from family members or friends? | 2.2% | 10.5% | 50.7% | 34.1% | 2.6% |
| Q1.38 | understand information on food packaging? | 10.6% | 24.8% | 39.8% | 22.4% | 2.4% |
| Q1.39 | understand information in the media on how to get healthier? | 4.3% | 18.2% | 49.1% | 25.3% | 3.0% |
| Q1.40 | understand information on how to keep your mind healthy? | 5.2% | 19.9% | 48.2% | 22.8% | 3.9% |
| Q1.41 | judge where your life affects your health and well-being? | 4.8% | 19.0% | 48.6% | 24.4% | 3.2% |
| Q1.42 | judge how your housing conditions help you to stay healthy? | 3.5% | 15.5% | 50.3% | 27.9% | 2.9% |
| Q1.43 | judge which everyday behaviour is related to your health? | 2.2% | 10.2% | 50.9% | 35.1% | 1.5% |
| Q1.44 | make decisions to improve your health? | 3.5% | 17.9% | 47.6% | 29.8% | 1.2% |
| Q1.45 | join a sports club or exercise class if you want to? | 8.9% | 14.1% | 35.4% | 37.2% | 4.3% |
| Q1.46 | influence your living conditions that affect your health and wellbeing? | 5.1% | 19.9% | 45.4% | 27.6% | 2.0% |
| Q1.47 | take part in activities that improve health and well-being in your community? | 10.1% | 26.1% | 38.8% | 18.1% | 6.9% |

The questions on health policies (Q 1.35 = 53%) or on reliability of media (Q 1.12 = 50% difficult), as well as the evaluation of different treatment options (Q 1.10 = 43% difficult) are on average the most difficult items throughout the participating countries. Item Q1.16 (follow instructions from your doctor or pharmacist) on the other hand was on average the easiest question with less than 6% of respondents indicating difficulties.

Table 3 shows the answer distributions of the 47 health literacy items per country only displaying the combined answer categories ‘fairly difficult’ and ‘difficult’, sorted by the mean percentage of respondents perceiving the items as difficult in the total sample. The difficulty of health literacy items varies considerably between countries. Most heterogeneous are the answers for the items Q1.45 (join a sports club or exercise class if you want) and Q1.47 (take part in activities that improve health and well-being in your community).

Table 3: Shares of ‘Fairly Difficult’ and ‘Very Difficult’ Answers for Health Literacy Items by Country

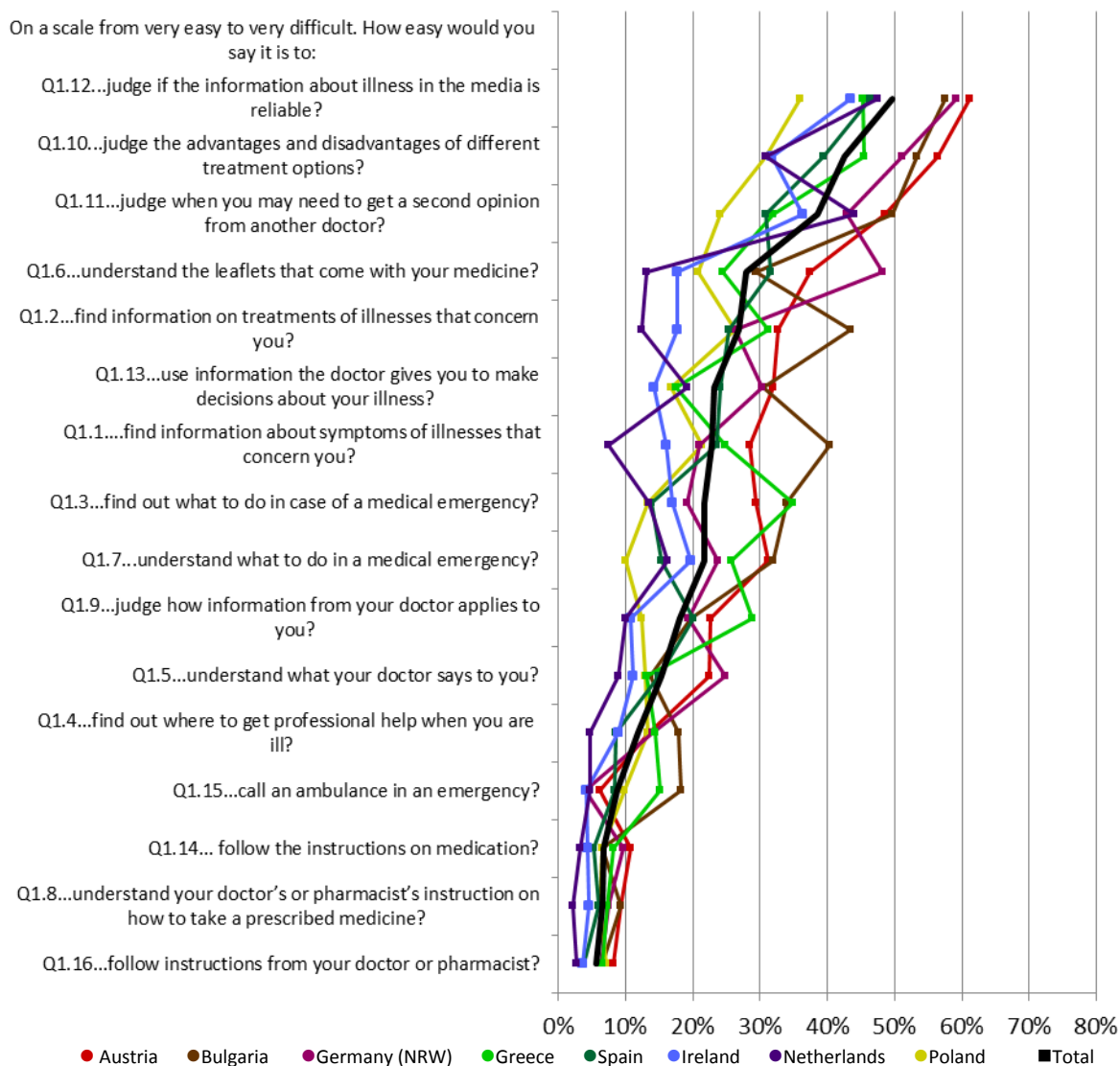
| | % of Individuals stating ‘very’ or ‘fairly difficult’ | | | | | | | | Total Mean |
|--|---|------|------|------|------|------|------|------|------------|
| | AT | BG | DE | EL | ES | IE | NL | PL | |
| Q1.1....find information about symptoms of illnesses that concern you? | 28.5 | 40.4 | 20.9 | 24.9 | 23.6 | 16.0 | 7.5 | 21.4 | 22.8 |
| Q1.2....find information on treatments of illnesses that concern you? | 32.7 | 43.5 | 26.3 | 31.3 | 25.4 | 17.7 | 12.3 | 26.2 | 26.9 |
| Q1.3....find out what to do in case of a medical emergency? | 29.4 | 34.0 | 19.2 | 34.8 | 13.8 | 17.0 | 13.4 | 13.3 | 21.8 |
| Q1.4....find out where to get professional help when you are ill? | 13.4 | 17.9 | 14.1 | 14.4 | 8.6 | 9.0 | 4.7 | 13.3 | 11.9 |
| Q1.5....understand what your doctor says to you? | 22.4 | 13.7 | 24.9 | 13.2 | 14.9 | 11.1 | 8.9 | 12.9 | 15.3 |
| Q1.6....understand the leaflets that come with your medicine? | 37.5 | 29.3 | 48.3 | 24.4 | 31.5 | 17.7 | 13.1 | 20.8 | 28.0 |
| Q1.7....understand what to do in a medical emergency? | 31.2 | 31.9 | 23.7 | 25.8 | 15.4 | 19.7 | 16.2 | 10.0 | 21.7 |
| Q1.8....understand your doctor’s or pharmacist’s instruction on how to take a prescribed medicine? | 9.2 | 9.3 | 7.5 | 7.3 | 5.9 | 4.6 | 2.1 | 6.1 | 6.5 |
| Q1.9....judge how information from your doctor applies to you? | 22.7 | 19.7 | 19.4 | 28.9 | 20.1 | 10.7 | 10.0 | 12.3 | 18.0 |
| Q1.10....judge the advantages and disadvantages of different treatment options? | 56.5 | 53.3 | 51.2 | 45.4 | 39.4 | 31.8 | 30.9 | 30.8 | 42.6 |
| Q1.11....judge when you may need to get a second opinion from another doctor? | 48.6 | 49.6 | 43.0 | 31.9 | 30.8 | 36.4 | 44.0 | 24.1 | 38.6 |
| Q1.12....judge if the information about illness in the media is reliable? | 61.2 | 57.5 | 59.1 | 45.3 | 46.3 | 43.4 | 47.4 | 36.0 | 49.7 |
| Q1.13....use information the doctor gives you to make decisions about your illness? | 31.9 | 30.4 | 30.3 | 17.5 | 24.0 | 14.2 | 19.2 | 16.7 | 23.1 |
| Q1.14.... follow the instructions on medication? | 10.7 | 6.5 | 9.7 | 8.2 | 5.2 | 4.3 | 3.2 | 6.5 | 6.8 |
| Q1.15....call an ambulance in an emergency? | 6.2 | 18.3 | 3.9 | 15.1 | 8.4 | 4.2 | 4.7 | 9.8 | 8.8 |
| Q1.16....follow instructions from your doctor or pharmacist? | 8.1 | 6.6 | 6.3 | 6.5 | 3.8 | 3.6 | 2.7 | 7.0 | 5.6 |
| Q1.17....find information about how to manage unhealthy behaviour such as smoking, low physical activity and drinking too much? | 20.5 | 26.2 | 14.2 | 16.4 | 11.5 | 11.0 | 2.8 | 15.3 | 14.7 |
| Q1.18....find information on how to manage mental health problems like stress or depression? | 38.1 | 49.8 | 36.3 | 31.6 | 32.3 | 30.7 | 22.0 | 27.9 | 33.5 |
| Q1.19....find information about vaccinations and health screenings that you should have? | 25.1 | 48.2 | 16.9 | 19.6 | 25.2 | 19.9 | 11.6 | 26.7 | 24.0 |
| Q1.20....find information on how to prevent or manage conditions like being overweight, high blood pressure or high cholesterol? | 20.8 | 34.3 | 15.6 | 18.7 | 16.7 | 12.8 | 6.3 | 20.3 | 18.1 |
| Q1.21....understand health warnings about behaviour | 16.1 | 14.5 | 10.3 | 15.0 | 6.7 | 7.5 | 1.8 | 11.0 | 10.3 |

| | | | | | | | | | |
|---|------|------|------|------|------|------|------|------|------|
| such as smoking, low physical activity and drinking too much? | | | | | | | | | |
| Q1.22...understand why you need vaccinations? | 19.6 | 36.3 | 14.9 | 16.7 | 11.7 | 15.8 | 4.8 | 13.7 | 16.6 |
| Q1.23...understand why you need health screenings? | 12.6 | 18.4 | 8.5 | 6.5 | 8.4 | 12.3 | 3.7 | 12.9 | 10.4 |
| Q1.24...judge how reliable health warnings are, such as smoking, low physical activity and drinking too much? | 20.8 | 20.1 | 14.0 | 16.7 | 12.2 | 7.5 | 9.2 | 14.5 | 14.4 |
| Q1.25...judge when you need to go to a doctor for a check-up? | 19.7 | 16.9 | 17.4 | 15.0 | 11.0 | 10.6 | 20.9 | 18.4 | 16.3 |
| Q1.26...judge which vaccinations you may need? | 34.5 | 62.4 | 29.9 | 32.0 | 25.2 | 26.6 | 23.2 | 29.2 | 32.7 |
| Q1.27...judge which health screenings you should have? | 24.2 | 43.1 | 19.7 | 15.5 | 20.5 | 28.3 | 23.2 | 27.7 | 25.1 |
| Q1.28...judge if the information on health risks in the media is reliable? | 49.3 | 47.2 | 54.6 | 40.2 | 35.8 | 36.2 | 44.9 | 27.0 | 42.1 |
| Q1.29...decide if you should have a flu vaccination? | 37.6 | 40.3 | 24.9 | 33.3 | 17.8 | 18.2 | 15.1 | 23.4 | 26.2 |
| Q1.30...decide how you can protect yourself from illness based on advice from family and friends? | 29.6 | 23.4 | 27.2 | 18.4 | 13.5 | 18.0 | 30.5 | 16.8 | 22.2 |
| Q1.31...decide how you can protect yourself from illness based on information in the media? | 47.4 | 41.2 | 39.3 | 36.7 | 31.6 | 33.7 | 38.7 | 25.5 | 36.9 |
| Q1.32...find information on healthy activities such as exercise, healthy food and nutrition? | 18.2 | 33.3 | 13.6 | 14.9 | 10.5 | 9.1 | 2.8 | 13.1 | 14.3 |
| Q1.33...find out about activities that are good for your mental well-being? | 25.8 | 45.1 | 24.5 | 16.7 | 16.1 | 19.6 | 13.6 | 20.4 | 22.6 |
| Q1.34...find information on how your neighbourhood could be more health-friendly? | 42.8 | 62.7 | 40.0 | 32.3 | 42.9 | 37.5 | 45.1 | 20.0 | 40.3 |
| Q1.35...find out about political changes that may affect health? | 61.6 | 71.0 | 60.3 | 44.2 | 49.9 | 43.1 | 55.7 | 40.0 | 53.2 |
| Q1.36...find out about efforts to promote your health at work? | 50.6 | 54.4 | 34.5 | 41.0 | 24.2 | 21.9 | 21.2 | 27.6 | 34.8 |
| Q1.37...understand advice on health from family members or friends? | 19.7 | 13.2 | 15.6 | 12.0 | 7.9 | 11.0 | 13.3 | 10.9 | 13.0 |
| Q1.38...understand information on food packaging? | 51.4 | 46.1 | 54.4 | 20.8 | 32.8 | 31.8 | 30.1 | 21.2 | 36.2 |
| Q1.39...understand information in the media on how to get healthier? | 31.5 | 30.8 | 29.6 | 19.3 | 25.3 | 20.6 | 13.6 | 15.3 | 23.3 |
| Q1.40... understand information on how to keep your mind healthy? | 32.9 | 43.1 | 32.7 | 22.1 | 16.5 | 23.4 | 17.3 | 21.1 | 26.1 |
| Q1.41...judge where your life affects your health and well-being? | 37.5 | 31.1 | 29.3 | 17.2 | 15.6 | 23.2 | 28.8 | 13.9 | 24.6 |
| Q1.42...judge how your housing conditions help you to stay healthy? | 32.7 | 21.7 | 29.8 | 11.4 | 12.6 | 19.1 | 16.9 | 11.6 | 19.5 |
| Q1.43...judge which everyday behaviour is related to your health? | 20.7 | 20.0 | 12.1 | 8.3 | 5.7 | 16.9 | 5.4 | 12.1 | 12.6 |
| Q1.44...make decisions to improve your health? | 30.3 | 31.9 | 24.1 | 24.9 | 11.1 | 11.1 | 21.1 | 18.9 | 21.7 |
| Q1.45...join a sports club or exercise class if you want to? | 21.1 | 58.4 | 12.1 | 30.4 | 19.6 | 10.9 | 10.4 | 32.8 | 24.1 |
| Q1.46...influence your living conditions that affect your health and wellbeing? | 30.2 | 41.2 | 21.1 | 32.7 | 23.8 | 14.4 | 19.6 | 21.7 | 25.5 |
| Q1.47...take part in activities that improve health and well-being in your community? | 45.3 | 61.9 | 33.0 | 40.6 | 37.4 | 13.3 | 45.7 | 36.6 | 38.9 |

In Austria and Germany (NRW) item Q1.15 (call an ambulance in an emergency) was the easiest task. In Greece, Spain and Ireland item Q1.16 (follow instructions from your doctor or pharmacist) had the lowest difficulty percentages. In Bulgaria respondents had the least difficulties with Q1.14 (follow the instructions on medication). Item Q1.21 (understand health warnings about behaviour such as smoking, low physical activity and drinking too much?) was with less than 2% difficulty shares the easiest item for respondents in the Netherlands, in contrast Polish respondents perceived item Q1.8 (understand your doctor's or pharmacist's instruction on how to take a prescribed medicine) as the easiest.

On the other hand ‘finding out about political changes that may affect health’ (Q1.35) was perceived as the most difficult task in all countries. Graph 1, Graph 2 and Graph 3 represent the graphical distributions of Tab. 3, the items are divided according to the three domains of health literacy, Graph 1 displaying health care items, Graph 2 disease prevention items and Graph 3 health promotion items. Again the items are arranged according to their averaged difficulty in the total sample.

Graph 1: Shares of ‘Fairly Difficult’ and ‘Very Difficult’ Answers of Health Care Items for Countries and Total

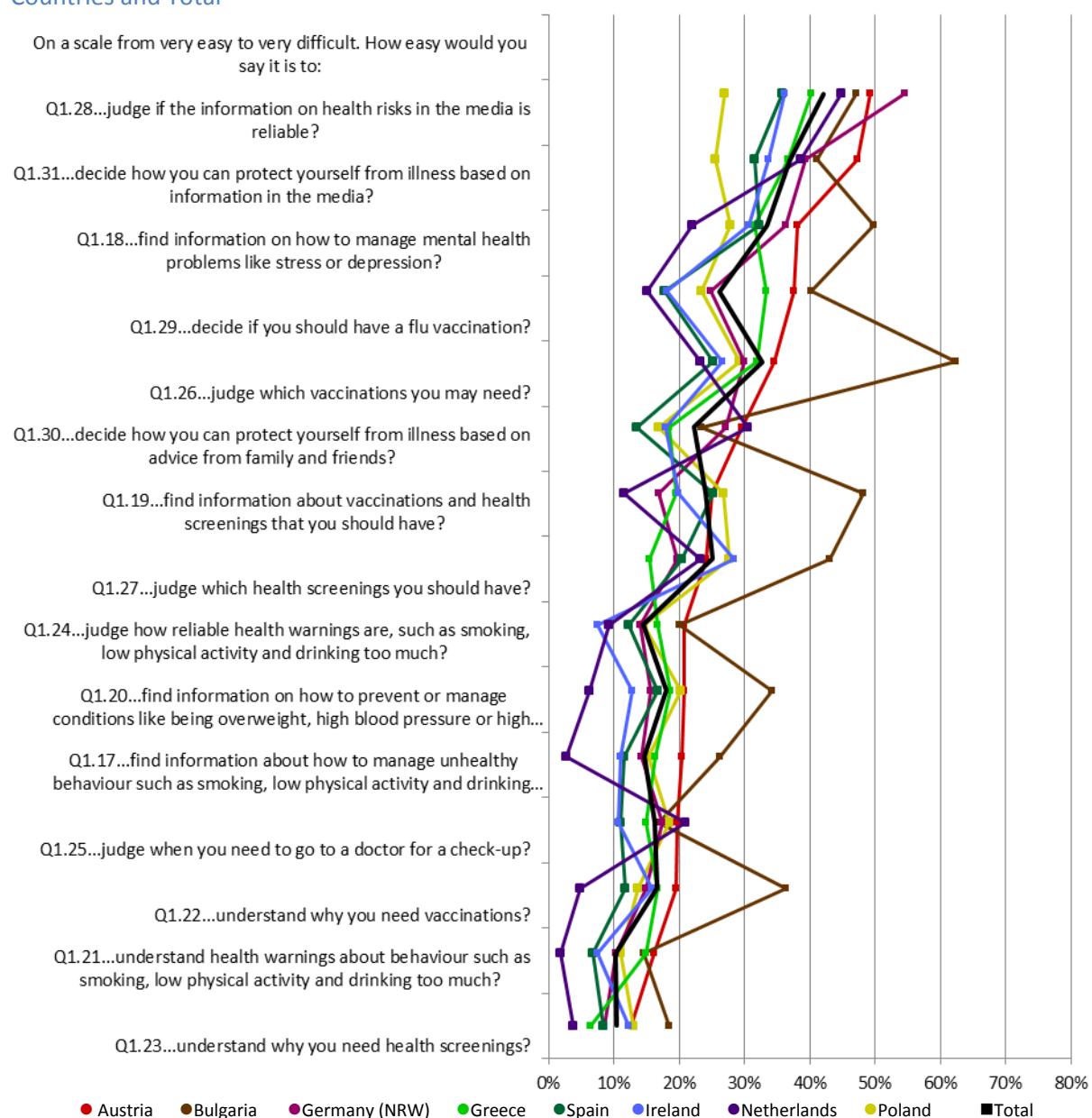


The perceived difficulty of the **health care** items range between 5.6% and 49.7% in the total sample. The most difficult item in the health care section is item Q1.12 (judge if the information about illness in the media is reliable). More than 30% of the total sample population perceive it as difficult to make judgements about different treatment options (Q1.10), and to judge if it is necessary to get a second opinion (Q1.11).

The most heterogeneous answer patterns are produced by the item Q1.6 asking how easy it is to understand the leaflets that come with medication. While only every ninth Dutch citizen seems to have difficulties to understand leaflets, almost 50% of the Germans stated difficulties with this task. Respondents perceived the least difficulties when confronted with direct instructions, for example on how to take a prescribed medication.

The most difficult disease prevention related item for the total sample asks for perceived difficulties when judging media reliability (Q1.28= 42% difficult). Furthermore illness protection based on information from the media (Q1.31) is perceived as difficult by almost 40% of the respondents of the total sample.

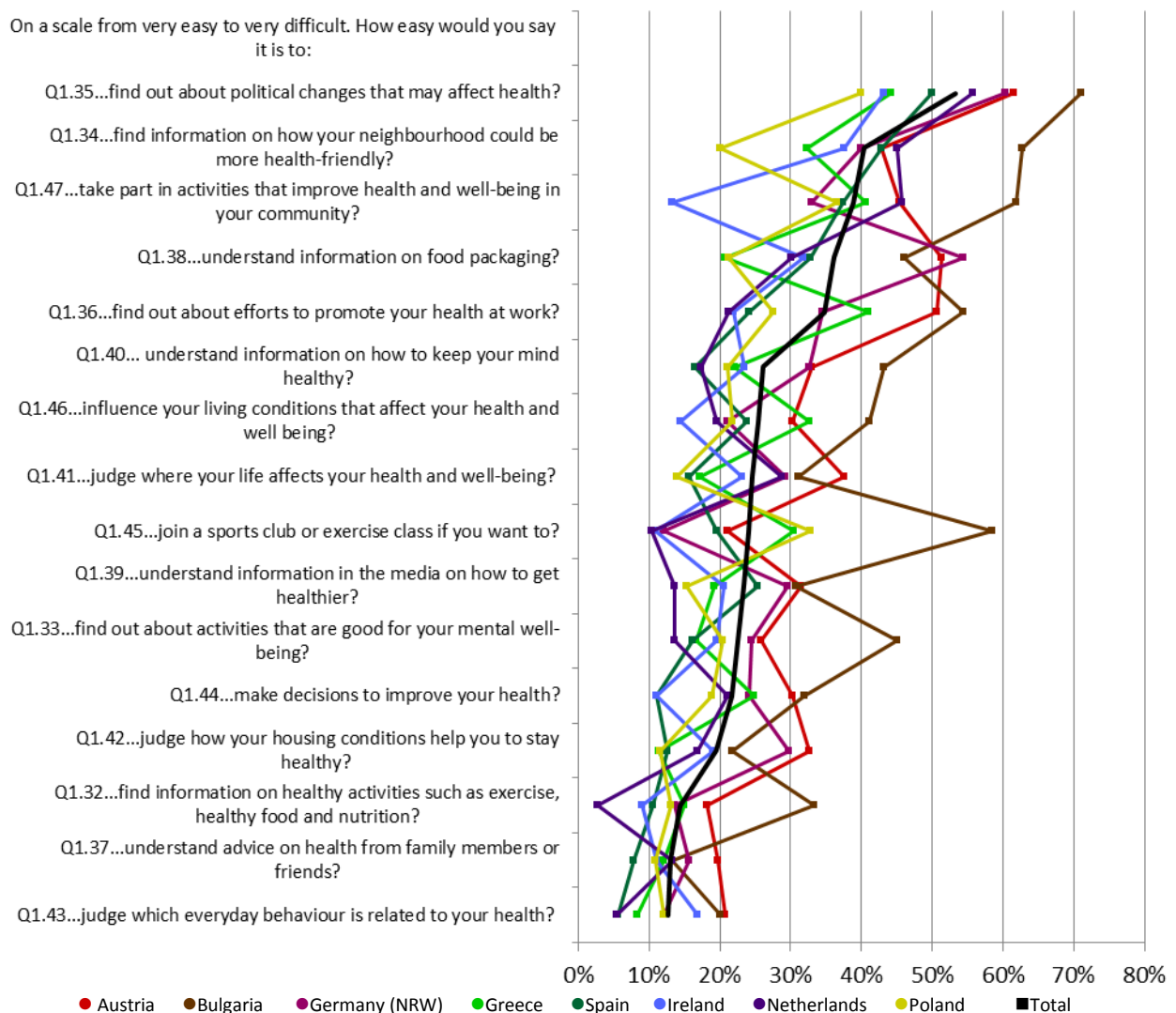
Graph 2: Shares of ‘fairly difficult’ and ‘very difficult’ Answers of Disease Prevention Items for Countries and Total



The difficulty perceived by the disease prevention items varies between 10.4 % and 42.1 % in the total sample. Compared to the health care items, the answer patterns for disease prevention items are more unevenly distributed across the 8 participating countries. Even questions that are perceived as less difficult, for example understanding health warnings or the need for health screenings, are rated differently: the shares of persons who perceive these tasks as difficult vary between 2% and almost 20% in the different countries.

Within the **health promotion** realm, this trend of variability between nations becomes even more pronounced; answer patterns seem even more dependent on various national traditions and contexts. Especially opportunities for community based health promotion differ across national contexts, and therefore produce very different answer patterns.

Graph 3: Shares of 'Fairly Difficult' and 'Very Difficult' of Health Promotion Items for Countries and Total



The assessment of changes in national health policies and how they affect health (item Q1.35) is on average, the most difficult task, followed by finding information on health promotion for neighbourhoods and activities for community health promotion. Individual health promotion (item Q1.43) and health promotion related to peers like family and friends (item Q1.37) on the other hand prove to be, on average, the easiest health promotion tasks.

2.4 Construction of Health Literacy Indices

The HLS-EU conceptual model can be represented by a number of indices. Each index represents a specific dimension of the health literacy concept and combines items related to this dimension. The following indices have been constructed:

- A general-HL index comprising all items and provides a general picture and overview.
- Three dimension specific indices covering healthcare, disease prevention and health promotion.
- Four information processing specific indices covering the different stages of information processing
- 12 sub-indices according to the cells in the HLS-EU data matrix (Table 1)

Table 4: Pearson Correlations of HL- Indices for Total

| | GEN-HL | HC-HL | DP-HL | HP-HL | FHI | UHI | JUI | AHI | HC-FHI | HC-UHI | HC-JUI | HC-AHI | DP-FHI | DP-UHI | DP-JUI | DP-AHI | HP-FHI | HP-UHI | HP-JUI | HP-AHI |
|---------------|--------|-------|-------|-------|-----|-----|-----|-----|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| GEN-HL | 1 | | | | | | | | | | | | | | | | | | | |
| HC-HL | .9 | 1 | | | | | | | | | | | | | | | | | | |
| DP-HL | .93 | .77 | 1 | | | | | | | | | | | | | | | | | |
| HP-HL | .92 | .7 | .8 | 1 | | | | | | | | | | | | | | | | |
| FHI | .93 | .82 | .86 | .86 | 1 | | | | | | | | | | | | | | | |
| UHI | .92 | .86 | .84 | .82 | .81 | 1 | | | | | | | | | | | | | | |
| JUI | .92 | .82 | .89 | .83 | .79 | .8 | 1 | | | | | | | | | | | | | |
| AHI | .9 | .79 | .82 | .85 | .76 | .77 | .78 | 1 | | | | | | | | | | | | |
| HC-FHI | .75 | .84 | .64 | .59 | .82 | .67 | .61 | .62 | 1 | | | | | | | | | | | |
| HC-UHI | .75 | .87 | .63 | .59 | .66 | .85 | .65 | .63 | .64 | 1 | | | | | | | | | | |
| HC-JUI | .78 | .84 | .67 | .63 | .67 | .67 | .85 | .65 | .59 | .63 | 1 | | | | | | | | | |
| HC-AHI | .73 | .81 | .64 | .56 | .61 | .7 | .62 | .77 | .58 | .66 | .55 | 1 | | | | | | | | |
| DP-FHI | .82 | .69 | .85 | .72 | .89 | .73 | .7 | .67 | .62 | .57 | .58 | .57 | 1 | | | | | | | |
| DP-UHI | .76 | .63 | .82 | .63 | .68 | .81 | .66 | .65 | .54 | .55 | .47 | .6 | .67 | 1 | | | | | | |
| DP-JUI | .82 | .67 | .9 | .7 | .7 | .7 | .9 | .7 | .53 | .54 | .63 | .55 | .64 | .66 | 1 | | | | | |
| DP-AHI | .73 | .57 | .78 | .64 | .6 | .61 | .69 | .77 | .45 | .46 | .57 | .45 | .51 | .5 | .65 | 1 | | | | |
| HP-FHI | .82 | .62 | .73 | .89 | .88 | .69 | .71 | .68 | .54 | .51 | .57 | .45 | .68 | .55 | .63 | .57 | 1 | | | |
| HP-UHI | .81 | .66 | .71 | .85 | .72 | .87 | .71 | .69 | .53 | .58 | .59 | .53 | .63 | .58 | .61 | .59 | .69 | 1 | | |
| HP-JUI | .72 | .54 | .63 | .79 | .61 | .64 | .77 | .62 | .43 | .47 | .48 | .46 | .54 | .53 | .56 | .5 | .61 | .63 | 1 | |
| HP-AHI | .72 | .54 | .61 | .81 | .63 | .57 | .6 | .85 | .47 | .42 | .48 | .46 | .54 | .48 | .53 | .48 | .6 | .55 | .53 | 1 |

In the data table above (Table 4) the indices are displayed, representing the HLS-EU concept in the following order:

- The whole matrix (general health literacy index (general-HL))
- The three columns of the matrix (health care health literacy (HC-HL); disease prevention health literacy (DP-HL); and health promotion health literacy (HP-HL))
- The four rows of the matrix (finding health information (FHI); understanding health information (UHI), judging health information (JHI) and applying health information (AHI))
- The twelve cells of the matrix - health care finding health information (HC-FHI cell 1), health care understanding health information (HC-UHI cell 2), health care judging health information (HC-JHI cell 3), health care applying health information (HC-AHI cell 4), disease prevention finding health information (DP-FHI cell 5), disease prevention understanding health information (DP-UHI cell 6), disease prevention judging health information (DP-JHI cell 7), disease prevention applying health information (DP-AHI cell 8), health promotion finding health information (HP-FHI cell 9), health promotion understanding health information (HP-UHI cell 10), health promotion judging health information (HP-JHI cell 11), health promotion applying health information (HP-AHI cell 12)

The indices are highly correlated. The general-HL index shows correlations of $r = .72-.82$ for the sub-indices related to the cells of the matrix of the conceptual model (see Table 1: p.8) as well as correlation coefficients of $r = .9-.93$ with the three area related and the four information related indices. General-HL has the highest averaged correlation with the other indices and consequently represents the best single measure of the sub-indices. Due to reporting feasibility, and in order to ensure a better overview of the health literacy results by the eight participating European countries, this report focuses on the general-HL index. In selected cases analyses for the three area specific indices (HC-HL, DP-HL, HP-HL) are provided in the appendix. More specific analyses, using specialised sub-indices have to be left to national analyses and reports and further international publications.

2.5 Details of Index Construction for the Four Main Indices

Index scores were only computed, for respondents who had rated (validly answered) at least 80% of the items associated to the specific indices. The row for item number in Table 6 illustrates how many items had to be valid in order to calculate the different indices. This procedure reduced the samples sizes for the participating countries and for specific indices somewhat differently (from 0.2% to 11.0% – see Table 5).

Table 5: Percentage of Respondents with Valid Index Scores for Four Main Indices by Country and Total

| | | GEN-HL | HC-HL | DP-HL | HP-HL |
|-----------------------|---------|--------|--------|--------|--------|
| Austria | Valid | 96.5% | 98.1% | 96.7% | 9 .7% |
| | Missing | 3.5% | 1.9% | 3.3% | 6.3% |
| Bulgaria | Valid | 92.3% | 95.4% | 92.3% | 90.0% |
| | Missing | 7 .7% | 4 .6% | 7 .7% | 10 .0% |
| Germany (NRW)* | Valid | 98 .8% | 98 .5% | 99 .1% | 95 .4% |
| | Missing | 1 .2% | 1 .5% | 0 .9% | 4 .6% |
| Greece | Valid | 99 .8% | 99 .8% | 99 .3% | 99 .4% |
| | Missing | 0 .2% | 0 .2% | 0 .7% | 0 .6% |
| Spain | Valid | 97 .4% | 98 .1% | 98 .6% | 95 .3% |
| | Missing | 2 .6% | 1 .9% | 1 .4% | 4 .7% |
| Ireland | Valid | 95 .5% | 96 .8% | 94 .3% | 95 .6% |
| | Missing | 4 .5% | 3 .2% | 5 .7% | 4 .4% |
| Netherlands | Valid | 97 .1% | 97 .1% | 97 .4% | 95 .7% |
| | Missing | 2 .9% | 2 .9% | 2 .6% | 4 .3% |
| Poland | Valid | 92 .1% | 94 .6% | 92 .0% | 89 .4% |
| | Missing | 7 .9% | 5 .4% | 8 .0% | 10 .6% |
| Total | Valid | 96 .2% | 97 .3% | 96 .3% | 94 .3% |
| | Missing | 3 .8% | 2 .7% | 3 .7% | 5 .7% |

*(NRW - North-Rhine-Westphalia)

2.6 Technical Properties of the Four Indices

For the calculation of the indices the items were inverted, so that a higher value denotes better health literacy with the following numerical values: 1=very difficult; 2=fairly difficult; 3=fairly easy; 4=very easy;

Table 6: General and Specific Health Literacy Indices and Their Respective Items; Minimum Number of Valid Answers Necessary for Index Calculation; Minima and Maxima of Scale Metric.

| ITEM | GEN-HL | HC-HL | DP-HL | HP-HL |
|---|--------|-------|-------|-------|
| Q1.1 | ✓ | ✓ | | |
| Q1.2 | ✓ | ✓ | | |
| Q1.3 | ✓ | ✓ | | |
| Q1.4 | ✓ | ✓ | | |
| Q1.5 | ✓ | ✓ | | |
| Q1.6 | ✓ | ✓ | | |
| Q1.7 | ✓ | ✓ | | |
| Q1.8 | ✓ | ✓ | | |
| Q1.9 | ✓ | ✓ | | |
| Q1.10 | ✓ | ✓ | | |
| Q1.11 | ✓ | ✓ | | |
| Q1.12 | ✓ | ✓ | | |
| Q1.13 | ✓ | ✓ | | |
| Q1.14 | ✓ | ✓ | | |
| Q1.15 | ✓ | ✓ | | |
| Q1.16 | ✓ | ✓ | | |
| Q1.17 | ✓ | | ✓ | |
| Q1.18 | ✓ | | ✓ | |
| Q1.19 | ✓ | | ✓ | |
| Q1.20 | ✓ | | ✓ | |
| Q1.21 | ✓ | | ✓ | |
| Q1.22 | ✓ | | ✓ | |
| Q1.23 | ✓ | | ✓ | |
| Q1.24 | ✓ | | ✓ | |
| Q1.25 | ✓ | | ✓ | |
| Q1.26 | ✓ | | ✓ | |
| Q1.27 | ✓ | | ✓ | |
| Q1.28 | ✓ | | ✓ | |
| Q1.29 | ✓ | | ✓ | |
| Q1.30 | ✓ | | ✓ | |
| Q1.31 | ✓ | | ✓ | |
| Q1.32 | ✓ | | | ✓ |
| Q1.33 | ✓ | | | ✓ |
| Q1.34 | ✓ | | | ✓ |
| Q1.35 | ✓ | | | ✓ |
| Q1.36 | ✓ | | | ✓ |
| Q1.37 | ✓ | | | ✓ |
| Q1.38 | ✓ | | | ✓ |
| Q1.39 | ✓ | | | ✓ |
| Q1.40 | ✓ | | | ✓ |
| Q1.41 | ✓ | | | ✓ |
| Q1.42 | ✓ | | | ✓ |
| Q1.43 | ✓ | | | ✓ |
| Q1.44 | ✓ | | | ✓ |
| Q1.45 | ✓ | | | ✓ |
| Q1.46 | ✓ | | | ✓ |
| Q1.47 | ✓ | | | ✓ |
| Minimum number of valid answers for index calculation | | | | |
| Item Number | 43 | 15 | 14 | 14 |
| Convenient metric of indices | | | | |
| Minimum | 0 | 0 | 0 | 0 |
| Maximum | 50 | 50 | 50 | 50 |

To allow convenient calculations with indices and to simplify comparisons, all eight scales were standardized on a metric between 0 and 50, using the following formula:

Formula:

$$Index = (mean - 1) * \left(\frac{50}{3}\right)$$

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 (leads to a minimum value of the index of 0)

3 is the range of the mean

50..... is the chosen maximum value of the new metric

2.7 Reliability of the Four Indices

Reliability of HL indices was assessed using Cronbach's alpha coefficients, a measure of internal consistency. Cronbach's alphas are based on Pearson correlations. The results are shown in Table 7. All Cronbach's alphas are in all countries and in the total sample reasonably high (minimum is 0.87 for the disease prevention literacy index in the Netherlands). Furthermore, all item correlate higher than 0.3 with the index. This indicates that all included items are selective enough to be part of the indices.

Table 7: Cronbach's Alphas for Indices for Countries and Total

| Cronbach's Alpha | AT | BG | DE(NRW) | EL | ES | IE | NL | PL | TOTAL |
|------------------|------|------|---------|------|------|------|------|------|-------|
| Gen HL* | 0.96 | 0.97 | 0.96 | 0.97 | 0.96 | 0.97 | 0.95 | 0.98 | 0.97 |
| HC HL* | 0.90 | 0.93 | 0.91 | 0.92 | 0.89 | 0.91 | 0.88 | 0.94 | 0.91 |
| DP HL* | 0.90 | 0.93 | 0.91 | 0.92 | 0.89 | 0.91 | 0.87 | 0.94 | 0.91 |
| HP HL* | 0.90 | 0.93 | 0.90 | 0.93 | 0.89 | 0.93 | 0.88 | 0.95 | 0.92 |

*All corrected item-total correlation >0.3

While the high values of Cronbach's alphas can be regarded as evidence for appropriate internal consistency of the indices, and as an indicator for index reliability, they would be misinterpreted if used as evidence for uni-dimensionality.⁷ Uni-dimensionality and measurement equivalence in different countries are therefore a concern of further psychometric assessment of the HLS-EU-Q.

Following our analyses so far, it is not assumed that the unweighted composite indices used in this report are uni-dimensional measures. Because both, contextual circumstances and individual traits have to be considered when interpreting results, HLS-EU-Q measures depend on personal competences as well as on context specific variables like national health cultures, the complexity or readability of national health care systems, the history of national information and media campaigns and the foci of national and regional health policies. HL indices can be interpreted as measures of an individual assessment of the complexity/uncertainty/manageability of different health relevant situations and tasks.

The type and specificity of the included items was decided according to the HLS-EU matrix, conceptual model and definition. Decisions were made by the HLS-EU consortium and its international collaborating partners in the health literacy expert community to assure a selection of items which is reasonably relevant for measuring health literacy in all participating countries. Thus the indices should provide useful information on national differences in perceived manageability of health relevant situations and tasks.

⁷ Cortina, J.M. 1993: What is coefficient alpha? An examination of theory and applications, *Journal of Applied Psychology*, 78(1).

2.8 Descriptive Results of the HLS-EU Health Literacy Indices

Means and standard deviations (see Table 8) vary slightly by kind of index. Health literacy, as measured by the HLS-EU-Q items, on average is somewhat higher for health care (mean = 34.7) or disease prevention (mean = 34.2) than for health promotion (mean = 32.5) in the total sample and on the country level.

But differences for means and standard deviations are more distinct by country for all four indices. For the general-HL index, which is mainly used in this report, means range from 30.5 (Bulgaria) to 37.1 (Netherlands) and standard deviations from 6.4 (Netherlands) to 9.2 (Bulgaria).

Table 8: Means and Standard Deviations (SD) of HL Indices for Countries and Total

| | | Countries | | | | | | | | |
|-----------------------------------|------|-----------|------|---------|------|------|------|------|------|-------|
| | | AT | BG | DE(NRW) | EL | ES | IE | NL | PL | Total |
| General Health Literacy Index | Mean | 32 | 30.5 | 34.5 | 33.6 | 32.9 | 35.2 | 37.1 | 34.5 | 33.8 |
| | SD | 7.6 | 9.2 | 7.9 | 8.5 | 6.1 | 7.8 | 6.4 | 8 | 8 |
| Health Care Literacy Index | Mean | 32.8 | 32.8 | 34.8 | 34.1 | 33.2 | 36.3 | 38 | 35.4 | 34.7 |
| | SD | 8.3 | 9.5 | 8.5 | 8.7 | 6.7 | 7.8 | 6.8 | 8.1 | 8.3 |
| Disease Prevention Literacy Index | Mean | 32.6 | 30.4 | 35.8 | 34 | 33.2 | 35.1 | 37.7 | 34.1 | 34.2 |
| | SD | 8.5 | 10.1 | 8.8 | 9.1 | 6.7 | 8.5 | 7.1 | 9 | 8.8 |
| Health Promotion Literacy Index | Mean | 30.5 | 27.9 | 32.9 | 32.7 | 32.2 | 34 | 35.7 | 33.8 | 32.5 |
| | SD | 8.8 | 10.2 | 8.9 | 9.6 | 6.9 | 9.7 | 7.6 | 8.8 | 9.1 |

Differences by country are somewhat smaller for the HC-HL index, which ranges from about 32.8 in Austria or Bulgaria to almost 38 in the Netherlands, than for the DP-HL- index (ranging from 30.4 in Bulgaria to 37.7 in the Netherlands) or for the HP-HL index, with a mean variation from 27.9 (Bulgaria) to 35.7 (Netherlands) (Table 8).

3 Results of the Newest Vital Sign (NVS) Test

For purposes of comparison and validation of the newly developed HLS-EU-Q one widely used objective test of functional health literacy was included into the HLS-EU study. The Newest Vital Sign test (UK version)⁸ is a rapid assessment instrument for measuring functional health literacy. It assesses the respondents' ability to read and apply information from imaginary ice cream nutrition label (see show card in appendix). The test requires a combination of literacy and numeracy skills. The respondent has to answer six questions related to the nutrition label. According to the number of correct answers (from 0 to 6) a raw score is computed indicating the likelihood of a certain level of functional health literacy.⁹ For that, three levels have been defined in the literature: (1) high likelihood of limited literacy (0-1 pts.), (2) possibility of limited literacy (2-3 pts.) and (3) high likelihood of adequate literacy (4-6 pts.). For further covariance, correlation and mean analysis in this report the more sensitive NVS raw scores (between 0 and 6) are used instead of the three NVS levels.

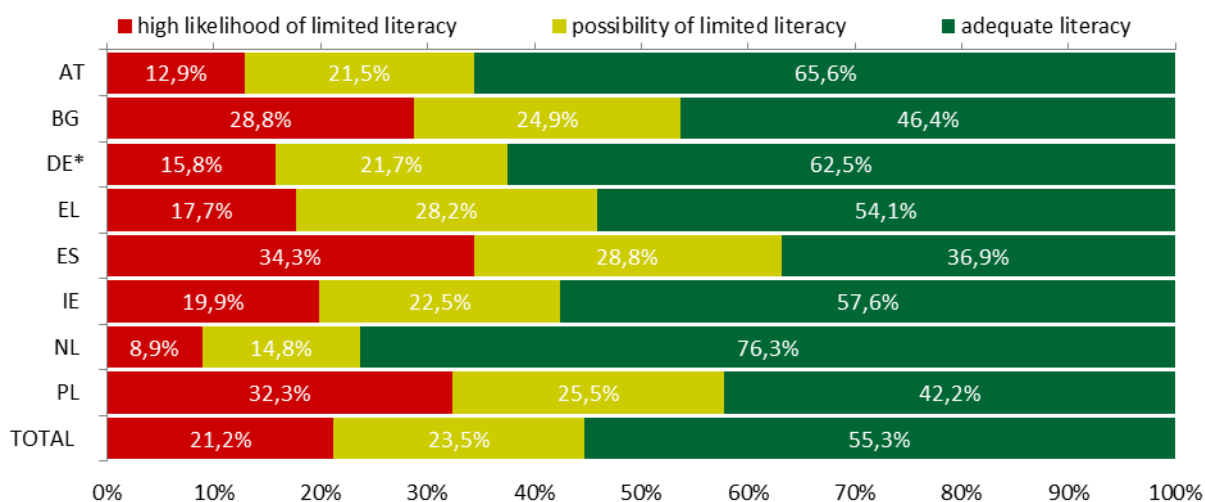
3.1 The NVS Test – Percentages and Associations

The distribution of the NVS levels shows that more than 21% of all respondents are very likely to have limited literacy and furthermore almost every 4th person is probably limited in literacy. About 55% in the total sample have adequate functional health literacy. The share of respondents with adequate functional health literacy doubles from about 37% in Spain to more than 76% in the Netherlands (see Graph 4).

⁸ Validation of a measure of health literacy in the UK: the Newest Vital Sign: Rowlands G, Khazaezadeh N, Oteng-Ntim, E, Seed P, Barr, S, Weiss B. In progress.

⁹ Weiss B. et al.(2005): Quick Assessment of Literacy in Primary Care: The Newest Vital Sign. Ann. Fam. Med.;3:514-522.

Graph 4: Percentages, Means and Standard Deviations of Three Levels of the Newest Vital Sign Test for Countries and Total



AT [N=1013] | BG [N=1002] | DE (NRW) [N=1057] | EL [N=1000] | ES [N=1000] | IE [N=1005] | NL [N=1023] | PL [N=1000] | TOTAL [N=8101]

*only North-Rhine-Westphalia (NRW)

| AT | BG | DE* | EL | ES | IE | NL | PL | Total |
|---------|--------|--------|--------|--------|--------|--------|--------|--------|
| ø4.1 | ø3.0 | ø3.9 | ø3.6 | ø2.6 | ø3.6 | ø4.5 | ø2.9 | ø3.5 |
| SD 0.81 | SD 1.9 | SD 2.1 | SD 2.0 | SD 2.0 | SD 2.1 | SD 1.8 | SD 2.1 | SD 2.1 |

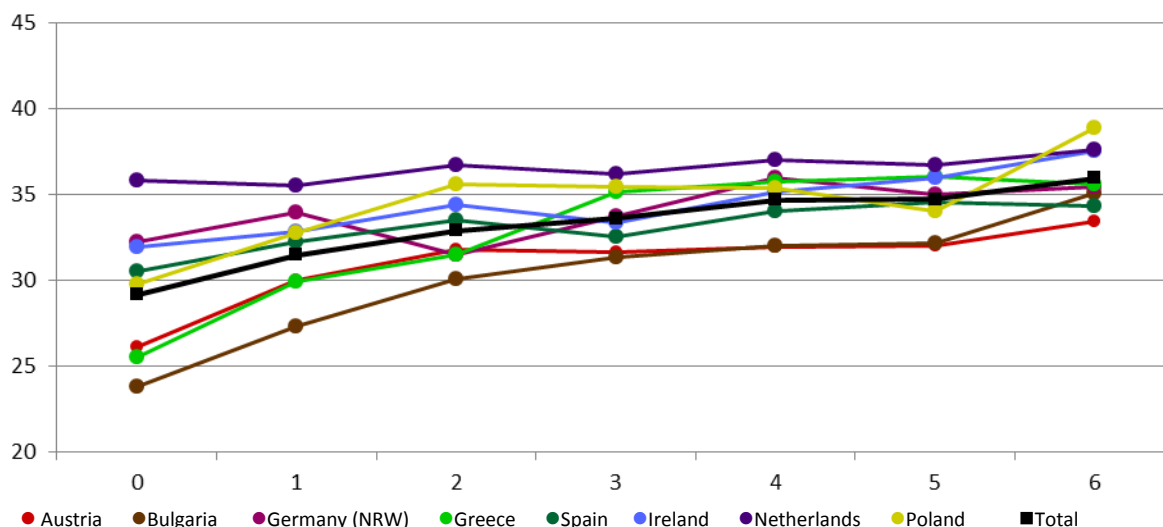
The means (and standard deviations) for the raw scores vary remarkably by country, from 2.6 for Spain to 4.5 in the Netherlands. As mentioned before, the test measures the respondent's numeracy, reading abilities and comprehension skills in relation to a nutritional food label. These abilities are associated with educational skills, which are measured in the HLS-EU study by the level of education. Therefore a considerable correlation ($r = .35$, see Table 13) between the level of education and the NVS score can be found for the general sample.

3.2 How is Health Literacy (HLS-EU) Associated with Functional Health Literacy (NVS)?

For the total sample the correlation between NVS score and general health literacy index is highly significant and with $r = .25$ of moderate amount (see Table 9). It is however smaller than the association of NVS test with level of education ($r = .35$) and much smaller than the intercorrelations between the different health literacy indices (see Table 4).

Correlations between NVS and the three domain related indices (highest for health care ($r = .24$) and lowest for disease prevention ($r = .22$)) are even smaller than between NVS and the general health literacy index. The associations between NVS and the HLS-EU-Q indices vary strongly by country; e.g. for the general health literacy index, there are countries with a definitely higher correlation of $r = .34$ (Bulgaria) or $r = .33$ (Poland) and at the other end with lower correlations of $r = .07$ for the Netherlands or $r = .13$ for Germany (see Table 9 and Graph 5).

Graph 5: Mean Scores of General Health Literacy by NVS Score for Countries and Total



How can the moderate extent of correlations and the national variations be understood best? NVS measures the personal competency of functional health literacy of individuals, mainly focussing on document literacy and numeracy. This competency, to a certain degree, can explain how difficult individuals or populations experience health related tasks. But, since for these tasks difficulty also differs to a very high degree by national and other situational or contextual factors, the explanatory power of NVS in terms of the HLS-EU-Q indices is limited. Therefore, only rather moderate correlations can be expected. National variations in associations with the two kinds of measures are partly caused by different 'objective' difficulties of the national health related systems and partly by differences in average individual competences, as measured by NVS scores (see Table 9).

Table 9: Spearman's Rho Correlations of NVS score with GEN-HL, HC-HL, DP-HL, and HP-HL for Countries and Total

| NVS and... | | AT | BG | DE | EL | ES | IE | NL | PL | TOTAL |
|------------|---|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| GEN HL | r | .196** | .340** | .131** | .292** | .225** | .236** | .069* | .328** | .245** |
| | N | 1007 | 1005 | 1161 | 1043 | 1009 | 972 | 992 | 1044 | 8233 |
| HC HL | r | .175** | .353** | .147** | .277** | .201** | .197** | .112** | .309** | .238** |
| | N | 1024 | 1039 | 1158 | 1043 | 1016 | 984 | 992 | 1080 | 8336 |
| DP HL | r | .174** | .338** | .082** | .228** | .169** | .188** | 0.046 | .324** | .219** |
| | N | 1009 | 1005 | 1164 | 1039 | 1020 | 961 | 994 | 1043 | 8235 |
| HP HL | r | .166** | .295** | .145** | .310** | .215** | .237** | 0.047 | .315** | .227** |
| | N | 981 | 979 | 1120 | 1039 | 986 | 973 | 979 | 1008 | 8065 |

** . Correlation is significant at the 0.01 level (2-tailed). * . Correlation is significant at the 0.05 level (2-tailed).

4 What is the Burden Limited Health Literacy in Europe?

While a number of studies used different measures to quantify the prevalence of limited health literacy in the US, Canada and Australia¹⁰ and Switzerland¹¹, so far no data regarding countries of the European Union are available. One of the aims of the HLS-EU project therefore was to produce first time data on the distribution of health literacy in various European countries and to research the prevalence of problematic or even inadequate health literacy in the respective populations.

In this chapter the setting of thresholds for inadequate health literacy and problematic health literacy is discussed, before the distributions of the identified health literacy levels for the four health literacy indices for countries and the total sample are presented.

4.1 Thresholds for Health Literacy Indices

For literacy and health literacy measures it is common and useful practice to define limited or problematic levels of literacy, to make health literacy measures on the level of general populations practicable and valuable for decision making in health policy. For that thresholds have to be defined, and justified. For the HLS-EU study four levels have been defined: 'inadequate', 'problematic' (which together also can indicate 'limited' health literacy), 'sufficient' and 'excellent'. Thus three different thresholds had to be chosen. Thresholds have been fixed for the four most important indices (general, healthcare, disease prevention and health promotion) used in this report and its appendix. The guiding criterion for the fixation of thresholds was the assessment of the likelihood of an individual to experience health relevant tasks and situations as difficult. Thresholds were set to minimize 'external' information loss. Therefore, categorized and metric indices produce very similar correlation strengths and patterns, regarding important covariates like NVS score, age, financial deprivation, social status, self-assessed health and frequency of doctor use. Furthermore, categorized indices were set to minimise 'internal' information loss by maximising their correlations with their corresponding metric indices.

¹⁰ Jordan, J.E.; Osborne, R.; Richard, H. 2011: Critical appraisal of health literacy indices revealed variable underlying constructs, narrow content and psychometric weakness, *Journal of Clinical Epidemiology*, p. 366-379, 64(4).

¹¹ The Swiss-Health Literacy Survey HLS-CH

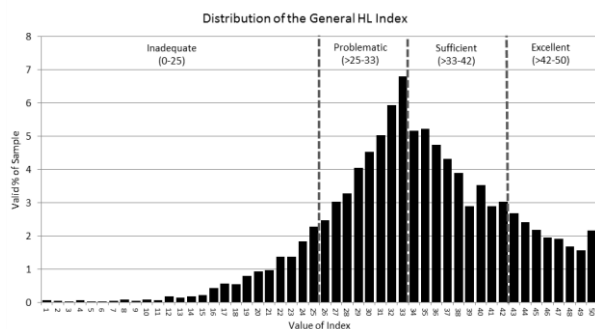
For 'inadequate' health literacy a threshold of below score 26 has been chosen, i.e. individuals with inadequate health literacy have at least rated 50% of the items as difficult or very difficult. The border between sufficient and problematic health literacy was fixed by a score value of 33, i.e. below 2/3 of the possible points that could be reached. This score coincides with the modus, median and mean of the distributions of the four indices which lie between 33 and 34 points. Thus the cutting point between problematic and sufficient health literacy approximates important point estimators of the distribution of the indices. The skewed normal distributions (see Table 10) indicate that the HLS-EU-Q indices are more sensitive and provide more information for lower literacy scores, especially for the three specific domain related indices. The cutting point between 'sufficient' and 'excellent' health literacy was designated by 42, which is equivalent to 5/6 of possible index points and approximately marks the bottom 80% and the top 20% population border.

To keep the differences in difficulty of the four indices comparable, the same numerical scores were chosen as thresholds for the four indices. Therefore, the somewhat different means and degrees of skewness of the four indices have not been adjusted for in constructing categorized health literacy indices. To summarize, the following score intervals were chosen for the four levels of health literacy: 0-25 pts. for 'inadequate', >25 to 33 pts. for 'problematic', >33 to 42 pts. for 'sufficient' and >42 to 50 pts. for 'excellent'.

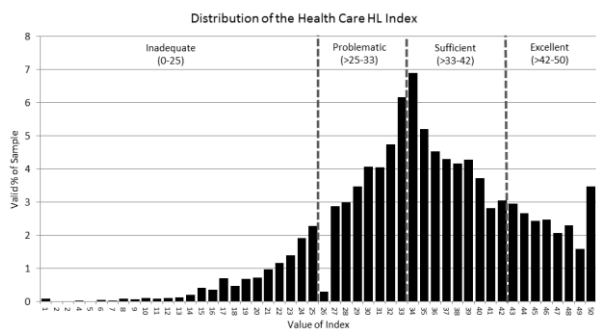
Table 10: Descriptive Statistics and Percentiles for GEN-HL, HC-HL, DP-HL and HP-HL for Total

| | | GEN-HL | HC-HL | DP-HL | HP-HL |
|-------------------------------|----------------|--------|-------|-------|-------|
| N | Valid | 7795 | 7883 | 7799 | 7643 |
| | Missing | 307 | 219 | 303 | 459 |
| Mean | | 33,8 | 34,7 | 34,2 | 32,5 |
| Std. Error of Mean | | ,090 | ,093 | ,099 | ,104 |
| Median | | 33,3 | 34,4 | 33,3 | 32,3 |
| Mode | | 33,3 | 33,3 | 33,3 | 33,3 |
| Std. Deviation | | 8 | 8,3 | 8,8 | 9,1 |
| Skewness | | -,256 | -,292 | -,336 | -,259 |
| Std. Error of Skewness | | ,028 | ,028 | ,028 | ,028 |
| Kurtosis | | ,287 | ,197 | ,218 | ,134 |
| Std. Error of Kurtosis | | ,055 | ,055 | ,055 | ,056 |
| Range | | 50 | 50 | 50 | 50 |
| Minimum | | ,0 | ,0 | ,0 | ,0 |
| Maximum | | 50 | 50 | 50 | 50 |
| Percentiles | 10 | 23,9 | 24,4 | 23,3 | 20,8 |
| | 20 | 27,7 | 28,1 | 27,8 | 25,0 |
| | 25 | 29,0 | 29,5 | 28,9 | 27,1 |
| | 30 | 30,1 | 31,0 | 30,0 | 28,1 |
| | 40 | 31,9 | 32,3 | 32,2 | 30,8 |
| | 50 | 33,3 | 34,4 | 33,3 | 32,3 |
| | 60 | 35,5 | 36,5 | 35,7 | 34,4 |
| | 70 | 37,8 | 38,9 | 38,9 | 36,7 |
| | 75 | 39,1 | 40,6 | 40,0 | 38,5 |
| | 80 | 40,8 | 41,7 | 42,2 | 40,5 |
| | 90 | 44,7 | 45,8 | 45,6 | 44,8 |

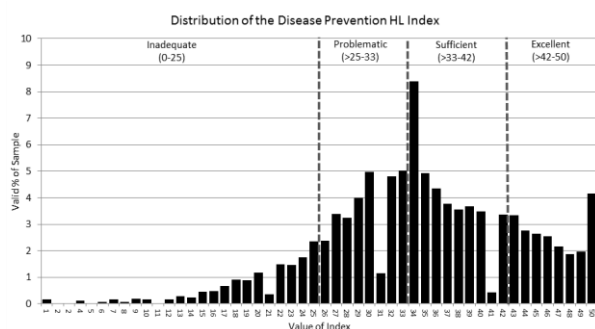
Graph 6: Distribution of the General HL Index for Total



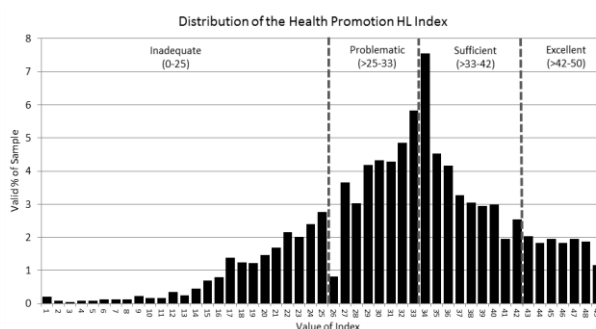
Graph 7: Distribution of the Health Care HL Index for Total



Graph 8: Distribution of the Disease Prevention HL Index for Total



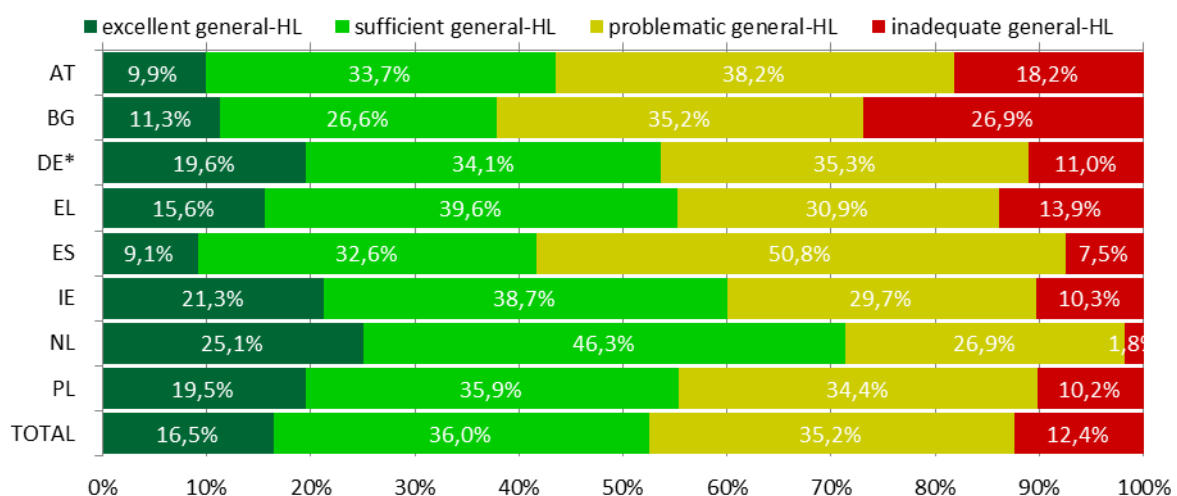
Graph 9: Distribution of the Health Promotion HL Index for Total



4.2 How Common is Inadequate, Problematic, Sufficient and Excellent Health Literacy in European Countries?

The four graphs in this chapter give an overview of the distribution of the four categorized HL indices (general-HL index, HC-HL, DP-HL and HP-HL) across the eight participating countries and the total sample. Somewhat more than every tenth (12.4%) respondent has inadequate general HL and more than every third (35.2 %) has problematic general HL. Nearly every second (47.6%) respondent's HL is limited, concerning general HL in the total sample (see Graph 10)

Graph 10: Percentages of General Health Literacy Levels Thresholds for Countries and Total



AT [N=979] | BG [N=925] | DE (NRW) [N=1045] | EL [N=998] | ES [N=974] | IE [N=959] | NL [N=993] | PL [N=921] | TOTAL [N=7795]

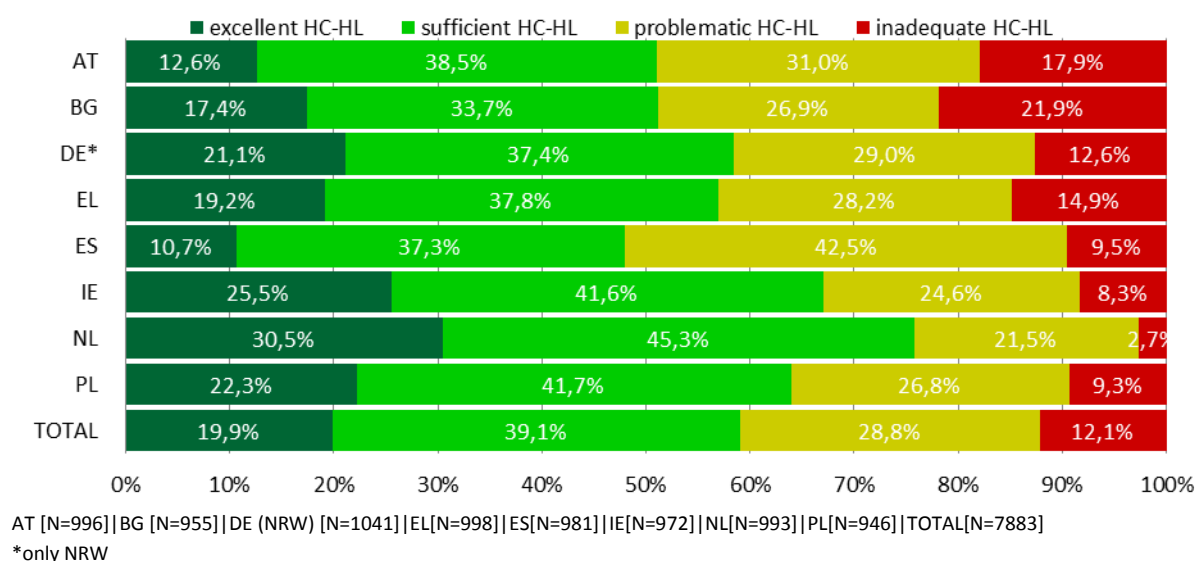
*only NRW

On the positive side of the HL spectrum the proportion for excellent general HL is 16.5% and for sufficient HL 36%. Thus, as far as limited general HL is concerned, the proportion is rather similar to the one shown by the NVS test with 44.7% (see Graph 10) which also reflects in the results of international studies¹². But as has been frequently mentioned, the variation by country is very pronounced. While just 1.8% have inadequate general HL in the Netherlands it is 26.9% or more than every fourth in Bulgaria, and for problematic general HL variation ranges from 26.9% in the Netherlands to 50.8% in Spain. For these two categories (together constituting limited HL) the proportion varies from 28.7% in the Netherlands to more than double (62.1%) in Bulgaria. Accordingly, on the positive side of HL, there is complementary variation for excellent and sufficient HL by country. The challenge of limited health literacy for health policy is substantial, but quite different in different member states of the EU.

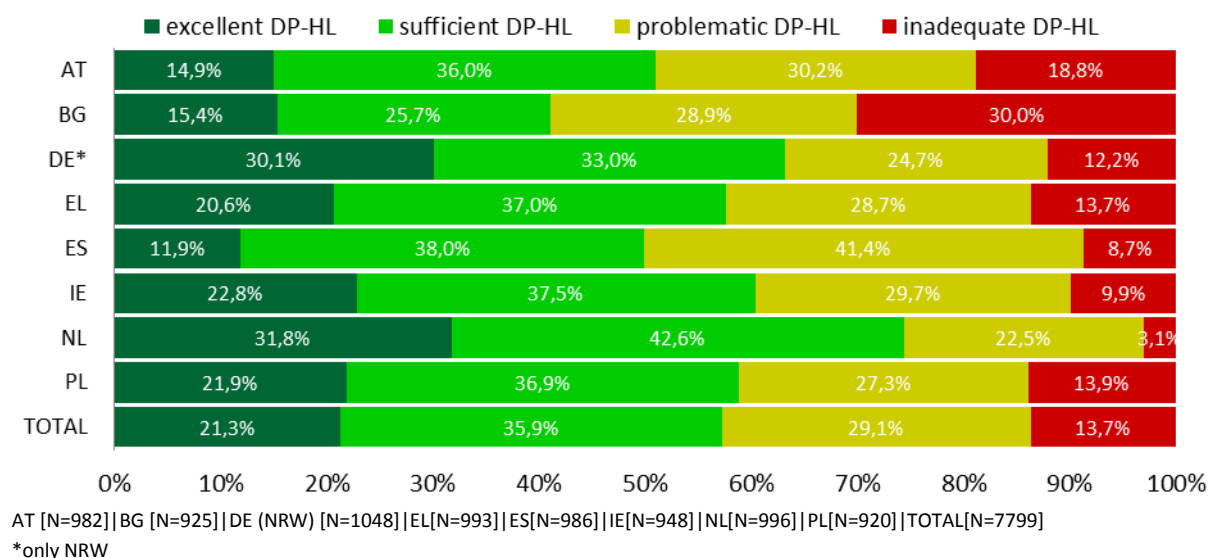
¹² Jordan, J.E.; Osborne, R.; Richard, H. 2011: Critical appraisal of health literacy indices revealed variable underlying constructs, narrow content and psychometric weakness, *Journal of Clinical Epidemiology*, p. 366-379, 64(4).

Compared to these differences by country, differences by kind of HL index are less prominent and follow comparable patterns. Levels of the three domain specific HL indices differ, as already shown for the metric indices (see Table 8). Again health care HL and disease prevention HL indices produce somewhat higher mean results than the health promotion HL index (see Graph 11-Graph 13). Proportion for inadequate HL is 12.1% for HC-HL respectively 13.7% for DP-HL, but 20.1% for HP-HL. For problematic HL differences are very small, 28.8% for HC-HL, 29.1% for DP-HL and 30.8% for HP-HL. For the combined levels of limited HL values are 40.9% for HC-HL, 42.8% for DP-HL and 50.9% for HP-HL. Variations by country follow similar patterns to the categorized general HL index.

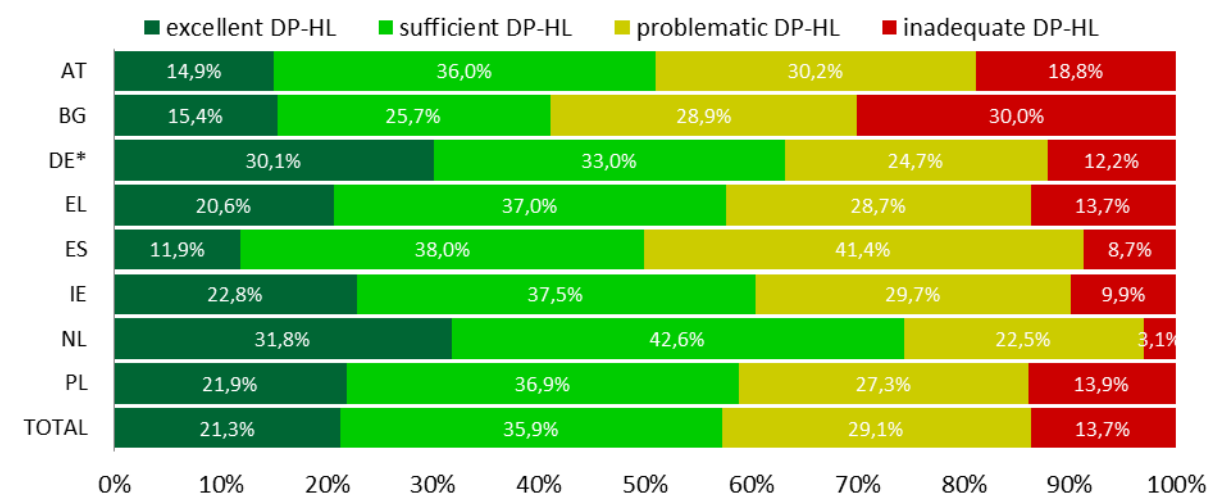
Graph 11: Percentages of Health Care Health Literacy Levels Thresholds for Countries and Total



Graph 12: Percentages of Disease Prevention Health Literacy Levels Thresholds for Countries and Total



Graph 13: Percentages of Health Promotion Health Literacy Levels Thresholds for Countries and Total



AT [N=951] | BG [N=902] | DE (NRW) [N=1009] | EL[N=994] | ES[N=953] | IE[N=961] | NL[N=979] | PL[N=894] | TOTAL[N=7643]

*only NRW

5 Percentages and Associations of the Socio-Economic and Socio-Demographic Indicators of the HLS-EU Survey

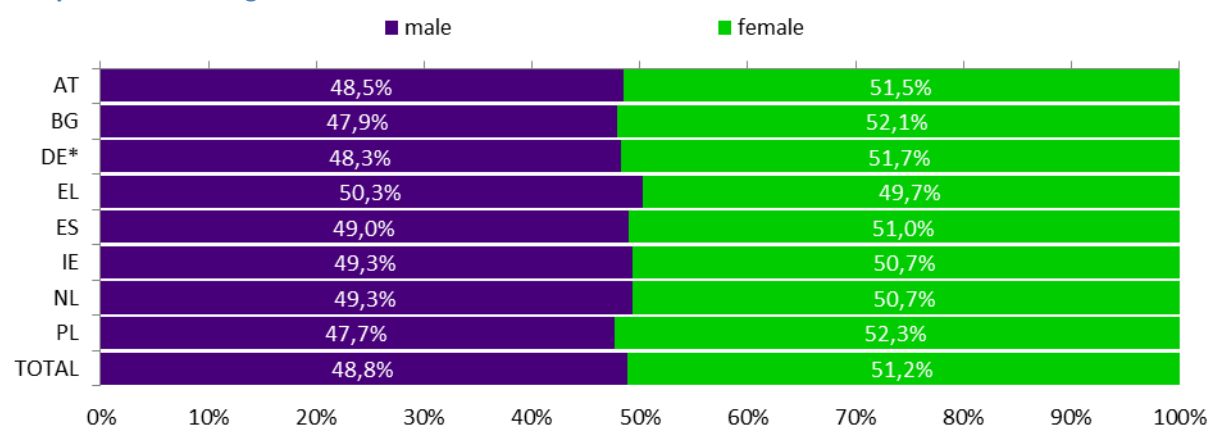
This chapter comprises percentages and associations of socio-economic and socio-demographic indicators which have been included in the HLS-EU study and are regarded as important determinants for health literacy according to the HLS-EU model (Figure 1). Some indicators which have been part of the study (like community size, national sub-regions) but were not surveyed on basis of international standard codes or are of primarily relevance for analyses on a national level, have not been analysed in this report and are left for further national analysis and reporting.

The distributions of variables are illustrated for the national samples and for the total sample. The total sample was not weighted by population size of countries. For the national samples a national weighting procedure was carried out, adjusting the sample to official population figures as provided by EUROSTAT or national statistic offices. Therefore, in terms of benchmarking, it has to be noted that the total sample does not describe the European average. This would not be suitable, since only 8 countries were surveyed, and a number of important countries and regions are missing. For the aggregation of the total sample a weighting procedure was chosen where all countries contribute with the same weight and almost equal sample sizes. As a result, the 'total' category represents an artificial average 'benchmarking country' that allows comparing a national sample to an unweighted, average of all 8 sampled countries.

5.1 Socio-Demographic Indicators: Gender, Age and Parental Migration

While **gender** is evenly and equally distributed throughout the country samples (the national samples are weighted by gender), the distributions of age and parental migration show some considerable differences. Gender is significantly correlated with employment status $r = .103$, and on a lower level with age and financial deprivation (Spearman's Rho correlation table see Table 13)

Graph 14: Percentages of Gender¹³ for Countries and Total



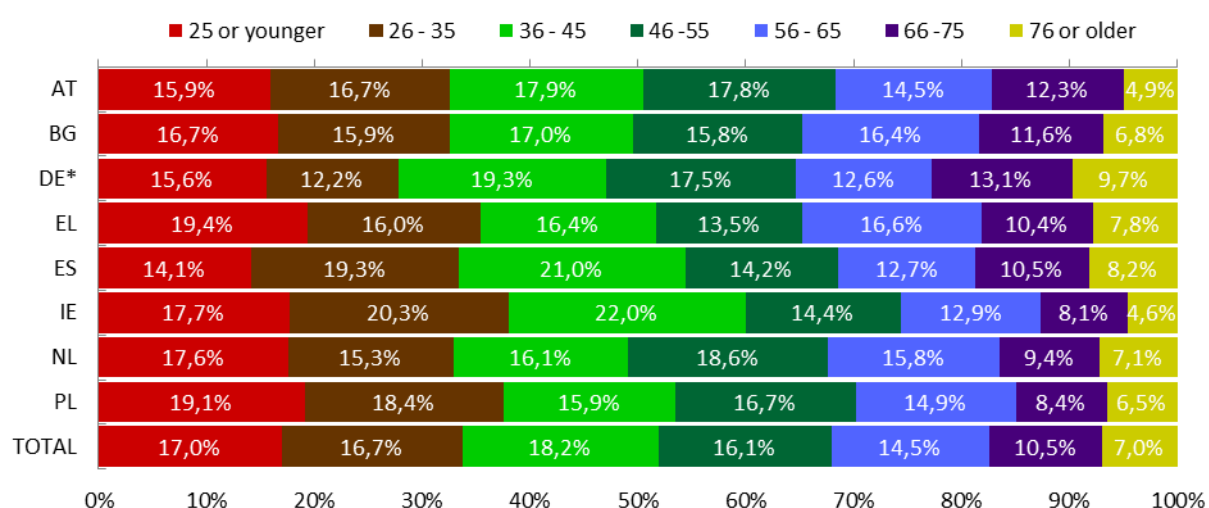
AT [N=1015] | BG [N=1002] | DE (NRW) [N=1057] | EL [N=1000] | ES[N=1000] | IE[N=1005] | NL[N=1023] | PL[N=1000] | TOTAL[N=8102]

*only NRW

¹³ As coded by interviewer

Considerable differences in **age** composition exist between countries. The mean age in the national sample ranges from 43.3 to 48.7 years (Ireland and Germany)¹⁴. This variation of more than 5 years has to be considered in country comparisons, since age is of predictive value not only for health status and other health related indicators, but also for health literacy.

Graph 15: Percentages, Means and Standard Deviations of Age¹⁵ Groups (10-year cohorts) for Countries and Total



AT [N=1013] | BG [N=1002] | DE (NRW) [N=1057] | EL [N=1001] | ES [N=1000] | IE [N=1005] | NL [N=1023] | PL [N=999] | TOTAL [N=8100]

*only NRW

| AT | BG | DE* | EL | ES | IE | NL | PL | Total |
|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| Ø46.0 | Ø46.5 | Ø48.4 | Ø46.2 | Ø46.3 | Ø43.3 | Ø46.2 | Ø44.7 | Ø46.0 |
| SD 18.0 | SD 18.4 | SD 19.1 | SD 19.5 | SD 18.5 | SD 17.6 | SD 18.8 | SD 18.4 | SD 18.6 |

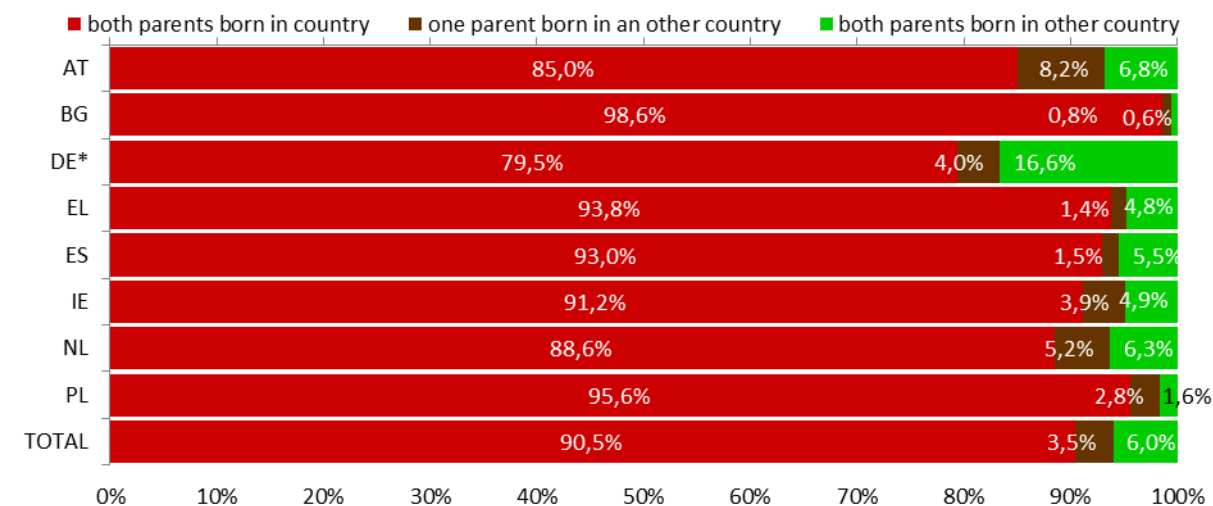
Age is significantly correlated with all other variables mostly with employment status $r = .493$ and NVS score $r = -.290$ (Spearman's Rho correlations see Table 13), followed by education, social status, financial deprivation, parental migration and gender these covariates and their possible intervening effects need to be considered when assessing associations between age and health literacy.

¹⁴ The percentage distribution of the variable 'age' for 10 year cohorts is presented in Graph 15

¹⁵ How old are you? (in years)

The shares of EU-citizens with **parental migration** range from about 1% in Bulgaria to more than 20% of the sample population in Germany. Since data for Germany were exclusively surveyed in North-Rhine Westphalia (NRW), these percentages may not be representative for Germany at large.

Graph 16: Percentages of Parental Migration¹⁶ Experiences for Countries and Total



*only NRW

Parental migration is correlated significantly but low with age $r = -.061$ (see Table 13)

5.2 Socio-Economic Indicators: Education, Social Status, Financial Deprivation and Status of Employment

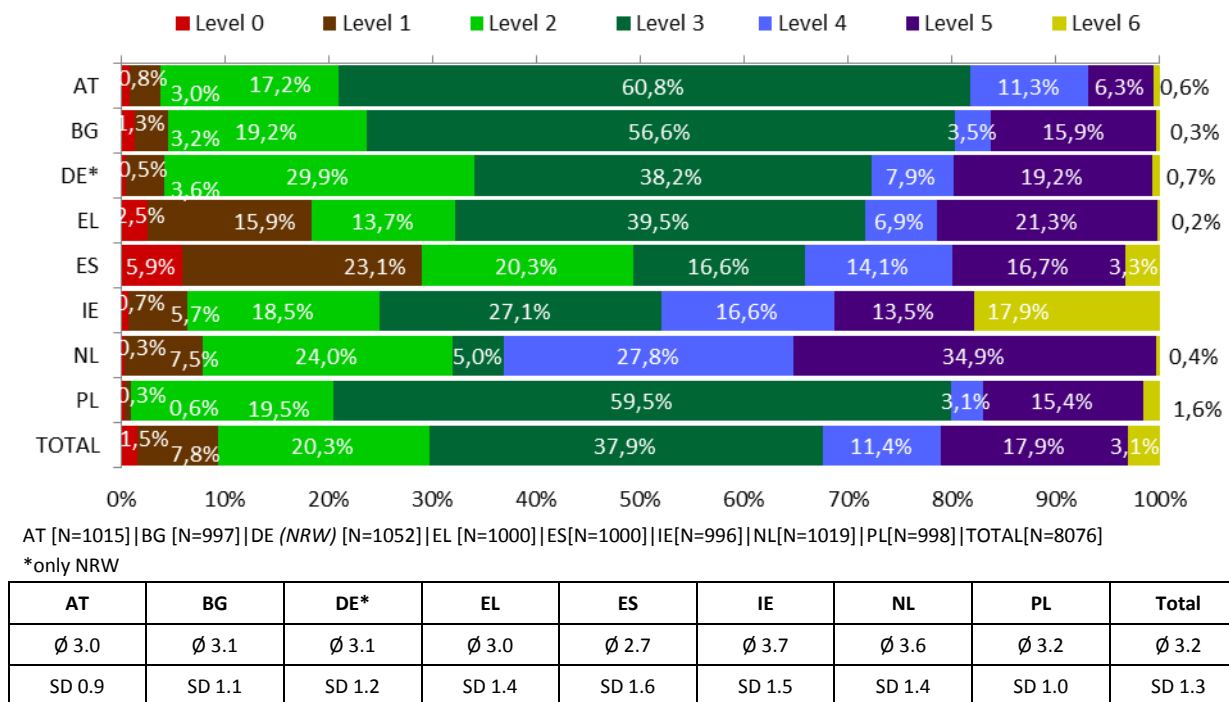
In this section the percentages and associations of education, social status, financial deprivation, status of employment as measured in the HLS-EU survey are presented.

Individual **education** levels (highest levels successfully completed) are compared through the ISCED (International Standard Classification of Education) system, which differentiates between 6 educational levels. ISCED level 0 applies to individuals with only pre-primary education (no school education). ISCED level 1 applies to people with primary (or basic) education. Levels 2 and 3 represent lower and upper secondary educational levels. Level 4 applies to individuals with post-secondary but non-tertiary education. Levels 5 and 6 indicate first and second stages of tertiary education. Since the coding procedure is country-specific, the coding schemes are presented in detail in the appendix.

¹⁶ The values of the 'parental migration' variable were recoded, the original coding was:

Which of these proposals corresponds to your situation? (1) Your mother and your father were born in (OUR COUNTRY) (2) One of your parents was born in (OUR COUNTRY) and the other was born in another Member State of the European Union (3) Your mother and your father were born in another Member State of the European Union (4) One of your parents was born in (OUR COUNTRY) and the other was born outside of the European Union (5) Your mother and your father were born outside the European Union (6) One of your parents was born in another Member State of the European Union and the other was born outside the European Union (7) DK\ Refusal (SPONTANEOUS)

Graph 17: Percentages, Means and Standard Deviations of Educational Levels (ISCED Levels¹⁷) for Countries and Total



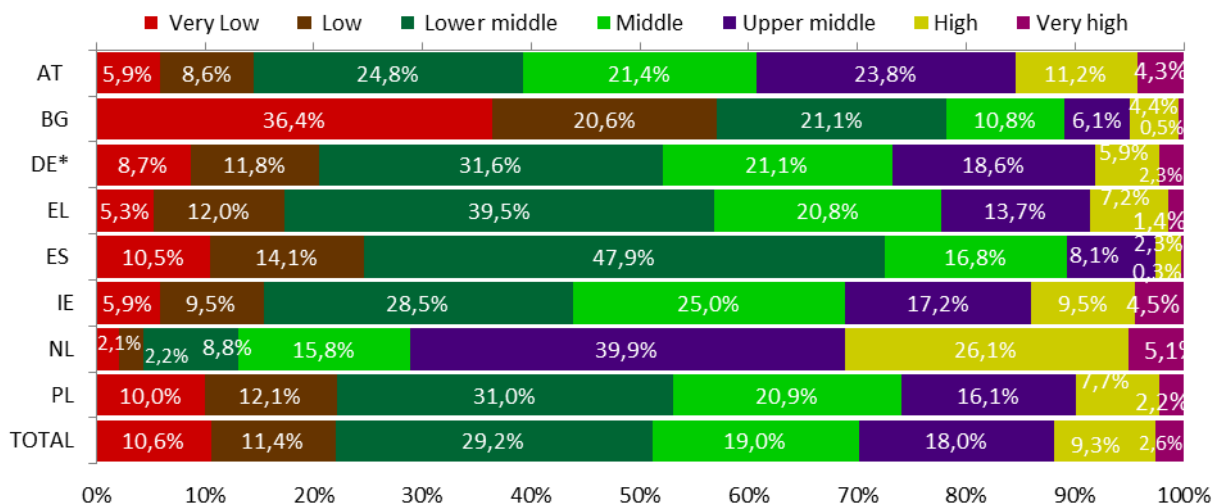
Achieved levels of education differ remarkably by country from a mean of 2.7 to one of 3.7. Outlier countries by mean of education are the Netherlands (3.6) and Ireland (3.7) with a considerably higher average of ISCED classified education than the average and Spain with a considerably lower (2.7) one.

Most variation occurs for level 3 (from 5% in the Netherlands to more than 60% in Austria), but also percentages for other levels vary strongly, the percentage of respondents with level 1 education ranges from less than 1% in Poland to almost a quarter of the Spanish sample. Percentages of ISCED level 6 vary from 0.3 % in Bulgaria to almost 18% in Ireland. While Austria, Germany and Poland show large shares of ISCED level 3 in their populations, the Netherlands and Ireland show remarkably high percentages for ISCED Levels 5 and 6. In summary, it can be said that there is a group of countries with a better educated population (Netherlands and Ireland), a middle group (Germany, Greece and Spain) and a lower group (Austria, Poland and Bulgaria). Education correlates considerably with NVS score $r = .35$, social status $r = .34$, employment status $r = .31$ and age $r = -.20$ (Spearman's Rho correlations see Table 13) when associating education with health literacy thus these indicators have to be considered as possible moderating and mediating factors.

¹⁷ What is the highest level of education you have successfully completed (usually by obtaining a certificate or diploma)? The Interviewer then recoded the answered by using the show card (see Appendix) and registered the ISCED code.

Also self-assessed **social status**, a subjective indicator for socio economic status, varies substantially by country.

Graph 18: Percentages, Means and Standard Deviations of Self-assessed Social Status¹⁸ for Countries and Total



AT [N=944] | BG [N=980] | DE(NRW) [N=1010] | EL [N=975] | ES[N=984] | IE[N=938] | NL[N=996] | PL[N=961] | TOTAL[N=7789]

*only NRW

| AT | BG | DE | EL | ES | IE | NL | PL | Total |
|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| ø 6.0 | ø 4.2 | ø 5.5 | ø 5.5 | ø 5.0 | ø 5.8 | ø 6.9 | ø 5.5 | ø 5.6 |
| SD 1.6 | SD 1.8 | SD 1.5 | SD 1.3 | SD 1.2 | SD 1.6 | SD 1.3 | SD 1.6 | SD 1.7 |

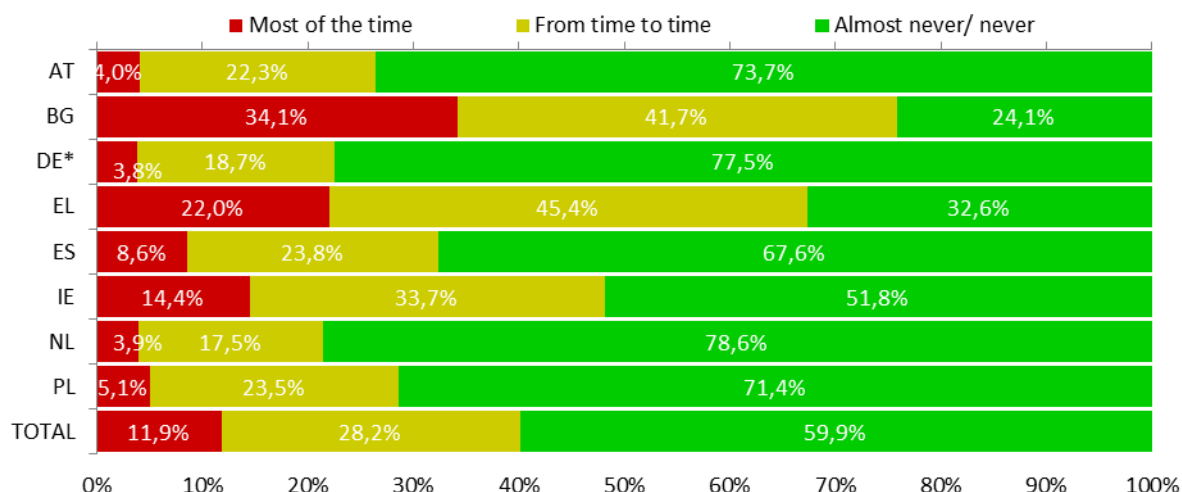
Variation ranges from an average self-assessed social status of 4.2 (low position) in Bulgaria to 6.9 (upper middle position) in the Netherlands. This variation has substantial consequences for the prevalence of limited health literacy in both countries. (see section 4) Aside from those two outliers the means lie between 5 (Spain) and 6 (Austria). Social status co-varies with a number of other important indicators (Spearman's Rho correlations see Table 13) like financial deprivation $r = -.42$, education $r = .34$, NVS score $r = .3$, employment status $r = -.19$ and age $r = .14$ which as well have to be considered as possible mediators or moderators of any effects from social status on health literacy.

¹⁸ On the following scale, step '1' corresponds to 'the lowest level in the society'; step '10' corresponds to 'the highest level in the society'. Could you tell me on which step you would place yourself? The variable was recoded and categories merged Values 1 to 3 = 'very low' and form together the lowest societal status. 4 = 'low' and 5 = 'lower middle'. 6 = 'middle'. 7 = 'upper middle'. 8 = 'high'. And 9 and 10 = 'very high'.

The HLS-EU-Q included four items measuring the economic status of respondents; one item asking for the monthly household net income and three items directed at the state of (health specific) financial deprivation, one related to the ability to afford to see a doctor, one related to the ability to pay for medication and the third one relating to general problems when paying bills.

More than 40% of respondents in the total sample indicated **difficulties to pay for bills** ('most of the time' or 'from time to time') at the end of a month. By country this varies extensively between the smallest percentage in the Netherlands (21.4%) and the highest in Bulgaria (75.8%), i.e. from a minority to a majority of the population. (Graph 19)

Graph 19: Percentages of Difficulties to Pay Bills at the End of the Month¹⁹ (last 12 month) for Countries and Total



AT [N=964] | BG [N=961] | DE(NRW) [N=1039] | EL [N=990] | ES[N=979] | IE[N=976] | NL[N=1014] | PL[N=986] | TOTAL[N=7909]

*only NRW

¹⁹ During the last twelve months, would you say you had difficulties to pay your bills at the end of the month...? (1) Most of the time (2) From time to time (3) Almost never\ never (4) Refusal (SPONTANEOUS)

For further analyses the three self-reported financial deprivation indicators were²⁰ combined to a single index using Principal Component analysis and regression factor scores (the scores are z-Values with a mean of zero and a standard deviation of 1). The question on the households' monthly income was not included in the financial deprivation index, as it was only answered by 75% of respondents and does not produce comparable data as the definition of household size, purchasing power and thresholds for poverty and poverty risks vary between countries²¹.

The distribution of the self-reported financial deprivation scores are shown in Graph 20-Graph 28. A negative factor score indicates less financial deprivation than in the average of the total sample. A factor score of 0 indicates the average, and a positive factor score indicates more financial deprivation than average.

The **financial deprivation** score (z-Values) shows considerable variations between countries. While respondents in Austria (-0.33), Germany (NRW) (-0.39), Spain (-0.43) and the Netherlands (-0.64) perceive less financial deprivation than average (average is 0), sample populations in Bulgaria (0.87), Greece (0.66) and Ireland (0.24) perceive more.

Table 11: Means and Standard Deviations of the Financial Deprivation Index for Countries and Total

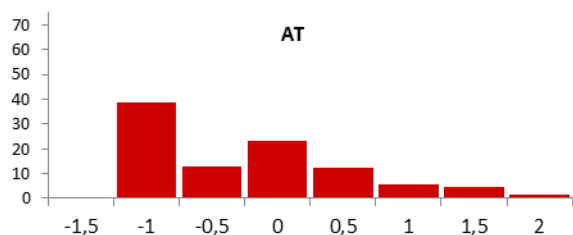
| AT | BG | DE* | EL | ES | IE | NL | PL | Total |
|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| Ø-0.32 | Ø0.87 | Ø-0.39 | Ø0.66 | Ø-0.43 | Ø0.24 | Ø-0.64 | Ø0.00 | Ø-0.01 |
| SD 0.81 | SD 1.07 | SD 0.79 | SD 0.97 | SD 0.72 | SD 1.02 | SD 0.63 | SD 0.76 | SD 1.00 |

²⁰ The Financial Deprivation Index consists of the variables D12 (Are you able to pay for medication if needed to manage your own health? It is...Very easy/Fairly easy/Fairly difficult/Very difficult), D13 (Are you able to afford to see the doctor? Is it ... (Instructions: time, health insurance, cost, transport) Very easy/Fairly easy/Fairly difficult/Very difficult) and D14 (During the last twelve months, would you say you had difficulties to pay your bills at the end of the month...? Most of the time/from time to time/Almost never-never) (missing values case wise).

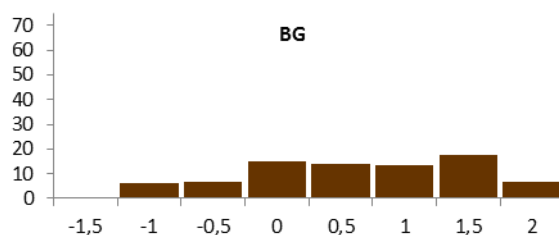
²¹ Eurostat (2011): Wages and Labour costs.

Available: http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Wages_and_labour_costs

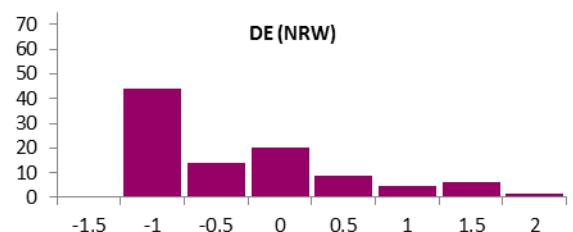
Graph 20: Percentage Distribution of Financial Deprivation Index



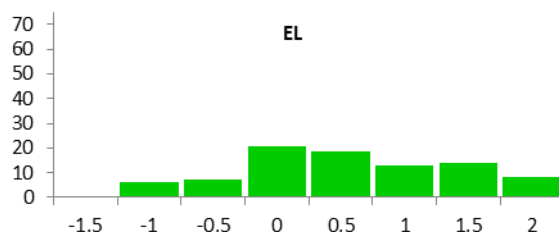
Graph 21: Percentage Distribution of Financial Deprivation Index



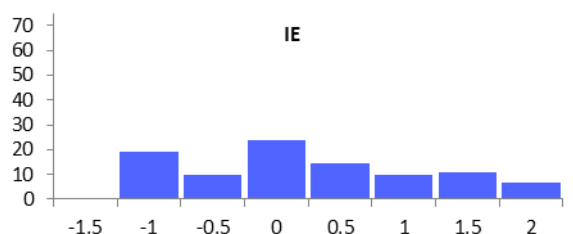
Graph 22: Percentage Distribution of Financial Deprivation Index



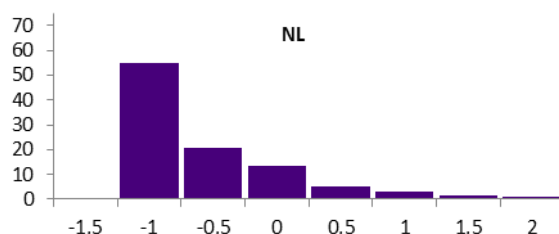
Graph 23: Percentage Distribution of Financial Deprivation Index



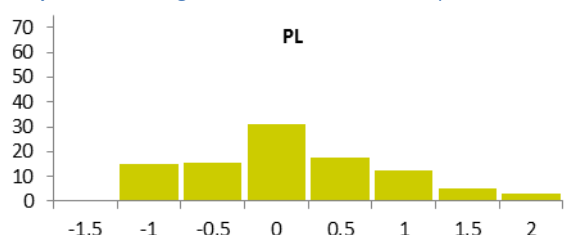
Graph 24: Percentage Distribution of Financial Deprivation Index



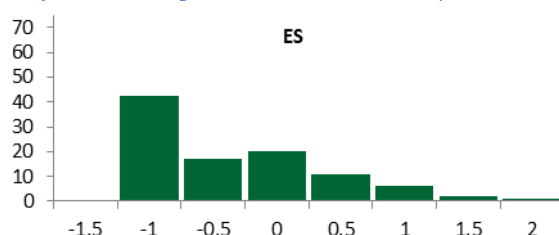
Graph 25: Percentage Distribution of Financial Deprivation Index



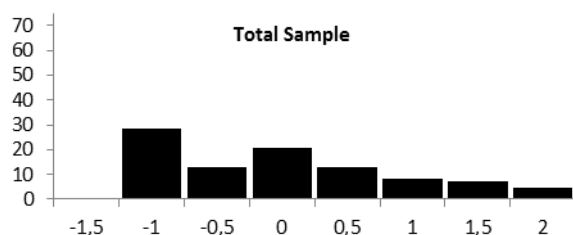
Graph 26: Percentage Distribution of Financial Deprivation Index



Graph 27: Percentage Distribution of Financial Deprivation Index



Graph 28: Percentage Distribution of Financial Deprivation Index



The self-reported financial deprivation index is substantially correlated with the objective monthly household income (see Table 12). Respondents with a comparatively low income also perceive more financial deprivation than the average. The correlation coefficients range from $r = -.28$ to $r = -.54$, showing that there is a stronger association between the monthly household net income and the financial deprivation index in Bulgaria than in the Netherlands. The financial deprivation index is significantly correlated to social status ($r = -.42$), education ($r = -.20$), the NVS score ($r = -.2$), the main status of employment ($r = .11$), and gender ($r = .05$) (see Table 13).

Table 12: Spearman's Rho Correlations between Financial Deprivation Index and Monthly Household's Income for Countries and Total

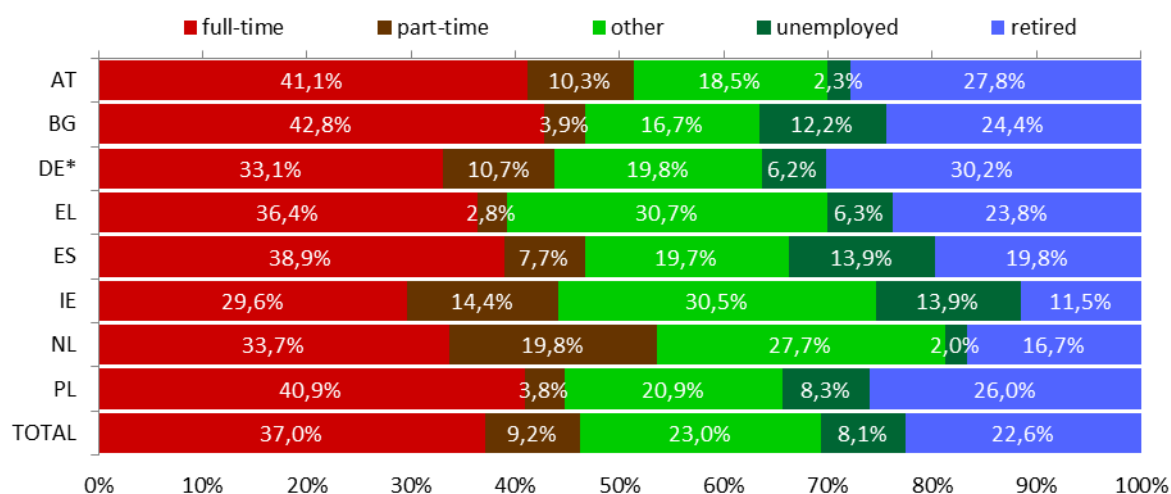
| Financial Dep. Index by | | AT | BG | DE*** | EL | ES | IE | NL | PL | TOTAL |
|-------------------------|----------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| Monthly Household's Net | <i>r</i> | -.342** | -.537** | -.463** | -.541** | -.359** | -.290** | -.282** | -.415** | -.388** |
| Income | N | 711 | 878 | 893 | 730 | 717 | 604 | 793 | 760 | 6086 |

** . Correlation is significant at the 0.01 level (2-tailed). * . Correlation is significant at the 0.05 level (2-tailed).

***only NRW

Main **status of employment** was measured as indicator for occupational status. Eleven answering categories were offered for this item, which were grouped into five categories for data analysis (Graph 29). There is considerable variation concerning employment status between countries. The retirement rate for the total sample is 22.6% and varies between 11.5% in Ireland and 30.2% in Germany; the unemployment rate is 8.1% in the whole sample, with the lowest share in Austria (2.3%) and highest in Spain and Ireland (13.9%). More than 9% of the respondents in the total sample indicated the category of part-time employment, ranging from 2.8 % in Greece to 19.8 % in the Netherlands.

Graph 29: Percentages of Main Status of Employments²² for Countries and Total



AT [N=1000] | BG [N=995] | DE(NRW) [N=1055] | EL [N=1000] | ES[N=997] | IE[N=992] | NL[N=988] | PL[N=995] | TOTAL[N=8022]

*only NRW

²² What is your current 'main' status of employment? (1) Carries out a job or profession, including unpaid work for a family business or holding, including an apprenticeship or paid traineeship, etc. (2) Full-time (3) Part-time (4) Unemployed (5) Pupil, student, further training, unpaid work experience (6) In retirement or early retirement or has given up business (7) Permanently disabled (8) In military or community services (9) Full-time homemaker, parent or carer (10) Inactive (11) Other (SPECIFY) (12) DK (SPONTANEOUS) (13) Refusal (SPONTANEOUS). For the Report answer categories were merged, the category 'other' consist of the answering options: 'Carries out a job or profession, including unpaid work for a family business or holding, including an apprenticeship or paid traineeship.', 'Pupil, student, further training, unpaid work experience', 'Permanently disabled', 'In military or community services', 'Full-time homemaker, parent or carer' and 'Inactive'.

Considerable correlations between main status of employment and age $r = .49$, education $r = -.31$, NVS score $r = -.25$, social status $r = -.19$, and financial deprivation $r = .11$ (Spearman's Rho correlations see Table 13) were found. The demographic and socio-economic predictor variables are intercorrelated in the total sample to quite different degrees (see Table 13).

Table 13: Spearman's Rho Correlations between Demographic and Socio-economic Variables for Total

| | | Gender | Age | Parental Migration | Education | Social status | Fin. deprivation | Employment status | NVS Total Score |
|--------------------|---|--------|---------|--------------------|-----------|---------------|------------------|-------------------|-----------------|
| Gender | r | 1 | | | | | | | |
| | N | 8566 | | | | | | | |
| Age | r | .066** | 1 | | | | | | |
| | N | 8566 | 8566 | | | | | | |
| Parental Migration | r | 0.014 | -.061** | 1 | | | | | |
| | N | 8545 | 8545 | 8545 | | | | | |
| Education | r | -0.018 | -.204** | 0.021 | 1 | | | | |
| | N | 8539 | 8539 | 8520 | 8539 | | | | |
| Social status | r | -0.007 | -.137** | 0.012 | .336** | 1 | | | |
| | N | 8227 | 8227 | 8209 | 8204 | 8227 | | | |
| Fin. deprivation | r | .050** | .036** | -0.013 | -.200** | -.422** | 1 | | |
| | N | 8169 | 8169 | 8148 | 8144 | 7902 | 8169 | | |
| Employment status | r | .103** | .493** | 0.002 | -.312** | -.189** | .107** | 1 | |
| | N | 8484 | 8484 | 8463 | 8459 | 8154 | 8097 | 8484 | |
| NVS Total Score | r | 0.011 | -.290** | 0.017 | .347** | .296** | -.196** | -.252** | 1 |
| | N | 8566 | 8566 | 8545 | 8539 | 8227 | 8169 | 8484 | 8566 |

**Correlation is significant at the 0.01 level (2-tailed).

*Correlation is significant at the 0.05 level (2-tailed).

For age, education and social status metric variable are used in the correlation table.

6 How Are Determinants Related to Health Literacy?

In this section associations of health literacy with possible determinants are presented. The general health literacy index is the health literacy measure used in this report (in the appendix data for the three domain related indices are also provided). Associations are indicated by bivariate Spearman regression coefficients and in the appendix in form of variance analyses. All indicators have already been presented in section 5: Percentages and Associations of the Socio-Economic and Socio-Demographic Indicators of the HLS-EU Survey. Besides the parental migration status, all included determinants show highly significant bivariate correlations with general health literacy in the total sample, but to a different extent – in descending order from self-assessed financial deprivation ($r = -.30$), self-assessed social status ($r = .29$), education ($r = .24$), age ($r = -.12$), main status of employment ($r = -.12$) to gender ($r = .05$).

Table 14: Spearman's Rho Correlations between General Health Literacy and Demographic Variables for Countries and Total

| General Health Literacy and... | | AT | BG | DE (NRW) | EL | ES | IE | NL | PL | TOTAL |
|-------------------------------------|---|---------|---------|-------------|---------|---------|---------|---------|---------|---------|
| Gender | r | .044 | .022 | .064* | -.039 | .019 | .088** | .094** | .068* | .046** |
| | N | 1007 | 1005 | 1161 | 1043 | 1009 | 972 | 992 | 1044 | 8233 |
| Age | r | -.142** | -.232** | .039 | -.305** | -.205** | -.007 | .097** | -.221** | -.121** |
| | N | 1007 | 1005 | 1161 | 1043 | 1009 | 972 | 992 | 1044 | 8233 |
| Parental Migration | r | -.014 | -.016 | -.065* | .01 | -.004 | .016 | .029 | .042 | .006 |
| | N | 1006 | 1000 | 1160 | 1043 | 1009 | 964 | 991 | 1042 | 8215 |
| Education (ISCED) | r | .168** | .250** | .156** | .399** | .239** | .184** | .157** | .240** | .239** |
| | N | 1007 | 999 | 1155 | 1043 | 1009 | 963 | 988 | 1043 | 8207 |
| Self-Assessed Financial Deprivation | r | -.260** | -.415** | -.282** | -.377** | -.128** | -.352** | -.141** | -.417** | -.300** |
| | N | 947 | 946 | 1117 | 1032 | 981 | 917 | 968 | 984 | 7892 |
| Self-Assessed Social Status | r | .159** | .374** | .103** | .335** | .170** | .329** | .175** | .285** | .291** |
| | N | 931 | 986 | 1110 | 1019 | 995 | 907 | 970 | 1016 | 7934 |
| Main status of employment | r | -.146** | -.252** | -0.018 | -.250** | -.146** | -.029 | -.035 | -.155** | -.119** |
| | N | 993 | 999 | 1159 | 1043 | 1006 | 960 | 959 | 1042 | 8161 |

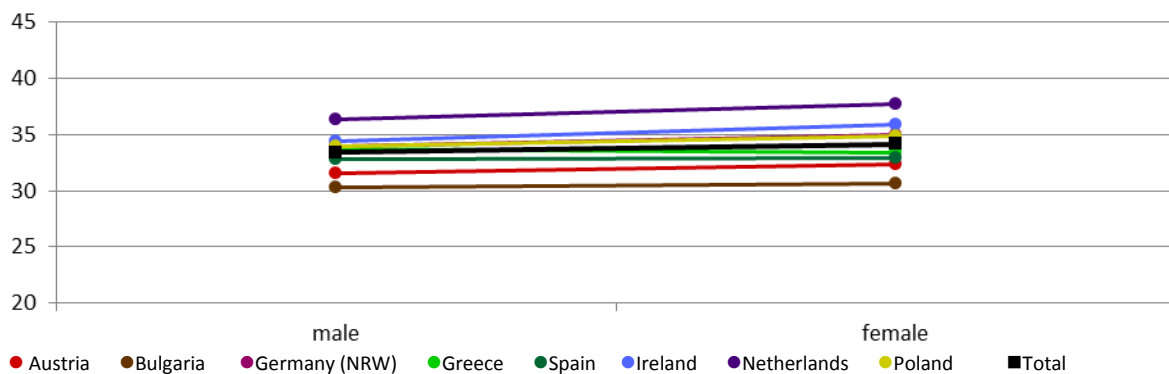
** . Correlation is significant at the 0.01 level (2-tailed). * . Correlation is significant at the 0.05 level (2-tailed).

For age, education and social status metric indicators are used in the correlation table.

6.1 How Is Health Literacy Associated with Demographic Indicators? Gender, Age and Parental Migration

Gender has only weak influence on the general health literacy. Correlations are insignificant ($\alpha=0.05$ level) for Austria, Bulgaria, Greece and Spain.

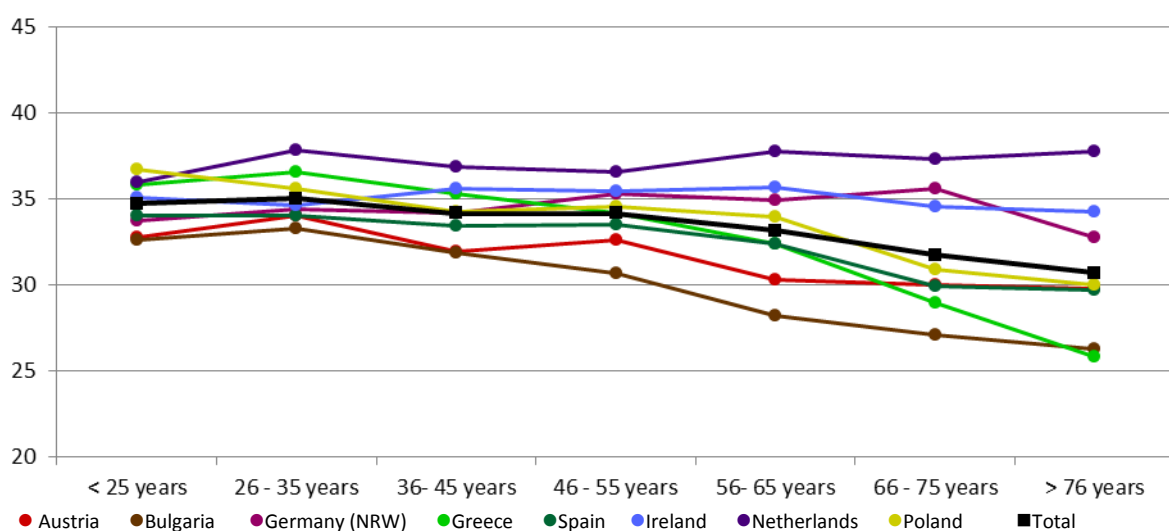
Graph 30: Mean Scores of General Health Literacy by Gender for Countries and Total



The largest effect of **gender** on health literacy was found in the Netherlands where the general trend that women tend to have somewhat higher HL than males ($r= .05$) has the strongest effect ($r= .1$), followed by Ireland ($r= .09$).

Age is a stronger predictor for health literacy ($r= -.12$). Older groups tend to have lower health literacy. Correlations are strongest for Greece ($r= -.31$), Bulgaria ($r= -.23$), Poland ($r= -.22$) and Spain ($r= -.21$), while for Ireland and Germany correlations were not significant.

Graph 31: Mean Scores of General Health Literacy by Age for Countries and Total



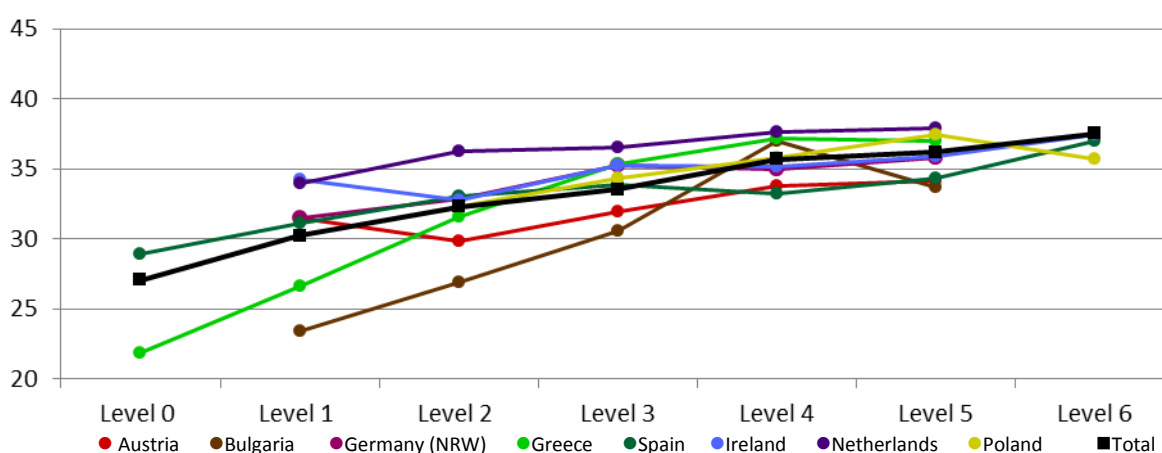
The most surprising result was found in the Netherlands ($r= .1$), where the general trend was reversed, and older cohorts tend to have slightly higher general-HL index means than younger cohorts. (see Table 14 and Graph 31)

For status of **parental migration** no significant associations with health literacy could be found, neither in the total sample nor in most of the national samples (see Table 14).

6.2 How is Health Literacy Associated with Socioeconomic Indicators? Education, Social Status, Financial Deprivation and Status of Employment

Education is considerably associated with health literacy ($r = .24$). Higher educated individuals tend to have higher scores for the general-HL index.

Graph 32: Mean Scores of General Health Literacy by Education²³ for Countries and Total

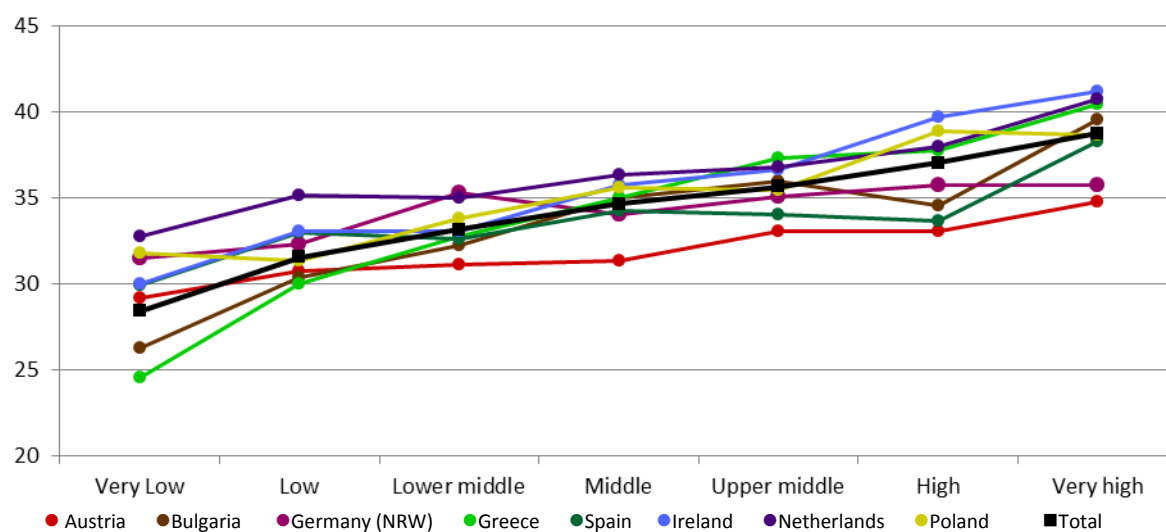


This effect is strongest in Greece ($r = .4$) and Bulgaria ($r = .25$), Poland ($r = .24$) and Spain ($r = .24$) where populations with low education levels have especially low general-HL index scores (see Table 14 and Graph 32). The smallest bivariate effect was found in Germany (.16), the Netherlands ($r = .16$) and Austria ($r = .17$), where health literacy levels improve the least for better educated groups (see Table 14 and Graph 32).

²³ only levels with $N > 10$ are illustrated

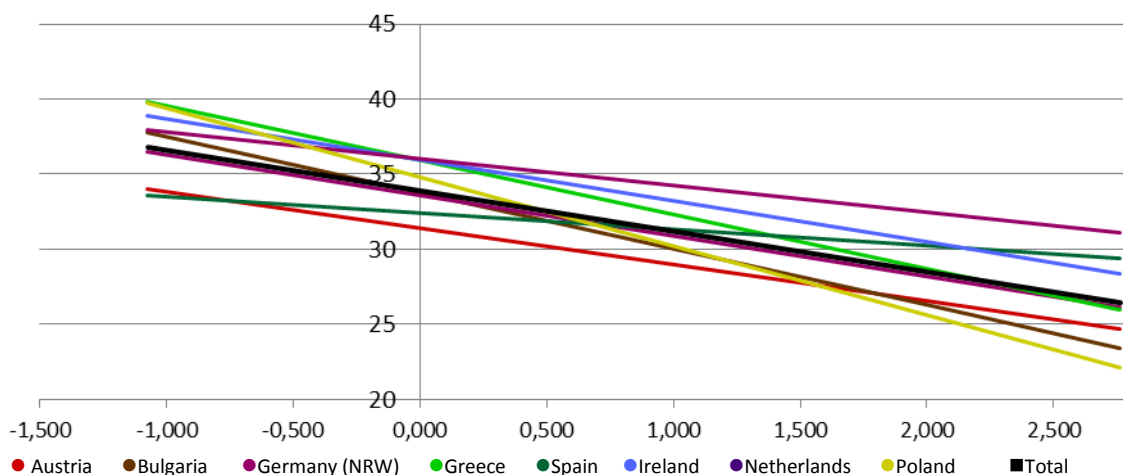
For **social status** the bivariate association with general health literacy ($r = .29$) is almost as strong, as the association for financial deprivation ($r = -.30$) in the total sample. It is the second most important predictor for health literacy found in the HLS-EU study. Again there is considerable variation by nations. Correlation is especially strong for Bulgaria, Greece and Ireland (for each more than .3) and weakest for and Germany ($r = .10$), Austria ($r = .16$), Spain ($r = .17$) and the Netherlands ($r = .18$). (see Table 14 and Graph 33)

Graph 33: Mean Scores of General Health Literacy by Social Status for Countries and Total



Self-reported **financial deprivation** for the total sample is the indicator, with the strongest bivariate association with health literacy ($r = -.30$). Individuals indicating less financial deprivation than the average tend to have higher general-HL index scores than individuals with high financial deprivation. This observation for the total sample holds true in all national subsamples.

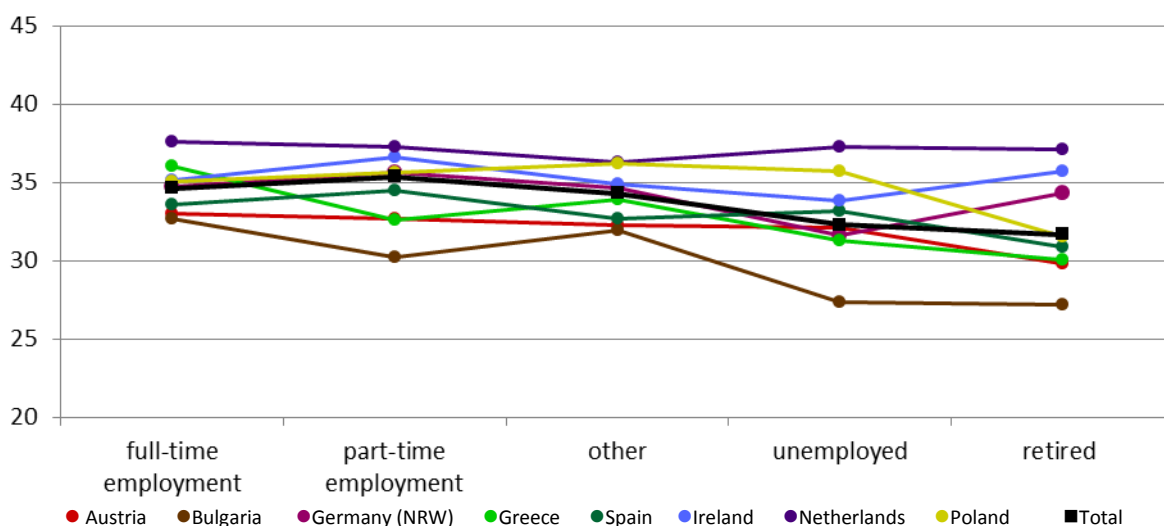
Graph 34: Mean Scores of General Health Literacy by Financial Deprivation for Countries and Total



Poland ($r = -.42$) and Bulgaria ($r = -.42$) have the strongest national effects, while populations in Spain ($r = -.13$), the Netherlands ($r = -.14$) and Austria ($r = -.26$) are, regarding their health literacy levels, the least affected by financial deprivation (see Table 14 and Graph 34).

Main **status of employment** is, in the general sample, of moderate predictive value ($r = -.12$). Individuals who are employed (fulltime or part-time) tend to score higher as others, unemployed or retired. However in Germany, Ireland and the Netherlands the relatively small correlation coefficients are not significant (see Table 14 and Graph 35).

Graph 35: Mean Scores of General Health Literacy by Main Status of Employment for Countries and Total



7 How Important Is the Social Gradient for Health Literacy, Functional Health Literacy (NVS) and Self-Perceived Health?

In the health literacy discourse the social gradient of/ or inequality in health literacy, is perceived as an important issue.²⁴ So far empirical evidence for the existing social gradient of health literacy was demonstrated mainly by tests on specific aspects of functional health literacy, like prose and document literacy, sub-domains of reading capacity, and numeracy.²⁵ In United States studies some demographic features have been associated with (on average) lower literacy levels, mainly for elderly people, ethnic minorities, women, or lower educated individuals.²⁶ However these prominently used health literacy measurement instruments have been criticized for measuring basic literacy skills, e.g. numeracy and word recognition, instead of health literacy.²⁷ The leading empirical evidence with regard to the social gradient of health literacy therefore is largely available just for the United States, Canada and Australia and is measured by functional general literacy and not by specific health literacy instruments.

In contrast, HLS-EU-Q provides HL indices based on carefully chosen and conceptually relevant indicators of *health* relevant tasks and situations and therefore provides high content validity for *health* literacy as compared to other measures. For comparative reasons also a measure for functional or basic health literacy – the NVS test - is included as well as a measure on self-assessed health status. To identify genuine or direct effects of different social gradients of HL, data are analysed by a multiple regression model, to control for spurious effects.

After testing demographic and socioeconomic predictors within a stepwise²⁸ regression model for the general-HL index as dependent variable, gender, age, education, scoring in the NVS test, financial deprivation and social status proved to be of predictive value for health literacy (at a significance level of 0.05). A regression model specified for these five predictor variables then was computed for general health literacy, Newest Vital Sign test and self-assessed health as dependent variables, for the total sample, as well as for the national samples (Table 15-Table 17).

²⁴ Kickbusch I. S, 2001: Health literacy: addressing the health and education divide. *Health Promotion International*; 16:289-297.

²⁴ De Leeuw E., 2012: The political ecosystem of health literacies *Health Promot. Int.* (2012) 27(1): 1-4

²⁵ Paasche-Orlow M.K, Parker R. et al., 2005: The prevalence of limited literacy. *J Gen Intern Med.* 2005 February; 20(2): 175–184.

²⁶ Ibid.

²⁷ Jordan E.; Osborne R.; Buchbinder R., 2010: Critical appraisal of health literacy indices revealed variable underlying constructs, narrow content and psychometric weaknesses. *Journal of Clinical Epidemiology*

²⁸ The stepwise entering algorithm automatically selects significant (based on F-statistic) Variables for a model and deletes variables from the model which become insignificant in the process of variable entering.

Table 15: General Health Literacy by Multiple Predictors (beta weight and adjusted Rsquare) for Countries and Total

| General Health Literacy by... | Austria | Bulgaria | Germany | Greece | Spain | Ireland | Netherlands | Poland | Total |
|--------------------------------|-------------------|-------------------|--------------------|-------------------|-------------------|--------------------|-------------------|--------|-------|
| Gender | .079 | .050 ^a | .094 | .029 ^a | .021 ^a | .074 | .119 | .090 | .063 |
| Age | -.145 | -.140 | -.016 ^a | -.173 | -.153 | -.019 ^a | .033 ^a | -.099 | -.094 |
| Education (Isced level) | .058 ^a | .107 | .102 | .224 | .138 | .046 ^a | .113 | .083 | .131 |
| Financial deprivation | -.234 | -.310 | -.230 | -.228 | -.071 | -.278 | -.142 | -.349 | -.239 |
| Social status | .040 ^a | .108 | .002 ^a | .111 | .069 | .228 | .115 | .068 | .142 |
| Adj. R square | .096 | .247 | .082 | .289 | .089 | .190 | .081 | .208 | .174 |

AT [N=838] BG [N=840] DE(NRW) [N=939] EL [N=961] ES [N=916] IE [N=847] NL [N=930] PL [N=814] TOTAL [N=7085]

a...not significant on the 0,05 level

GenHL-Index from 0=minimal HL to 50=maximal HL

Gender from 0=male to 1=female

Age in years

Financial deprivation from low deprivation to high deprivation

Social status from 1=lowest place in society to 10=highest place in society

The multivariate model accounts for more than 17% (R-square) of the total variation of **general health literacy**. Its predictive value is higher for Bulgaria, Greece and Poland (24.2%/ 28.9%/ 20.8%) than for the other countries, indicating that HL in these three countries is influenced stronger by socio-economic indicators. **Financial deprivation** (beta= -.24 in the total sample) is the most important predictor variable for health literacy in almost all countries (except Spain). Variation by country is considerable from beta= -.35 for Poland to beta= -.07 for Spain. **Self-assessed social status** is the second strongest predictor in the total sample (beta= .14), also varying considerably, between the highest value in Ireland (beta= .23) and lowest insignificant one in Germany (beta= .00) or Austria (beta=.04). **Education** follows on third position (beta= .13 for the total sample), ranging from beta= .22 (Greece) to beta= .05 (Ireland) or beta= .06 (Austria). Health literacy decreases with increased **age**, the fourth significant indicator (beta= -.1 for the total sample). Age is of predictive value in the majority of the countries (highest beta= -.18 for Greece), but not so in Germany, Ireland and the Netherlands. **Gender** is the fifth significant social predictor for HL, although it is not significant in three countries, it's a significant predictor for the Netherlands (beta= .12), Germany (beta= .09), Poland (beta= .09), Austria (beta= .08) and Ireland (beta= .07), were females on average have higher health literacy scores than males.

Table 16: Newest Vital Sign Test Scores by Multiple Predictors (beta weight and adjusted Rsquare) for Countries and Total

| NVS by... | Austria | Bulgaria | Germany | Greece | Spain | Ireland | Nether-lands | Poland | Total |
|--------------------------------|---------|-------------------|-------------------|-------------------|--------------------|-------------------|--------------------|-------------------|-------|
| Gender | .073 | .072 | .007 ^a | .018 ^a | -.024 ^a | .045 ^a | .063 | .122 | .041 |
| Age | -.114 | -.248 | -.306 | -.322 | -.291 | -.100 | -.415 | -.260 | -.231 |
| Education (Isced level) | .151 | .215 | .237 | .296 | .265 | .255 | .294 | .208 | .231 |
| Financial deprivation | -.151 | -.131 | -.074 | .004 ^a | -.053 ^a | .034 ^a | -.033 ^a | -.116 | -.069 |
| Social status | .088 | .038 ^a | .070 | .137 | -.027 ^a | .219 | .133 | .024 ^a | .159 |
| Adj. R square | .097 | .192 | .184 | .340 | .221 | .162 | .290 | .194 | .214 |

AT [N=895] BG [N=923] DE(NRW) [N=975] EL [N=964] ES [N=958] IE [N=878] NL [N=971] PL [N=899] TOTAL [7462]

a...not significant on the 0,05 level

NVS from 0=minimal functional health literacy to 6=maximal functional health literacy

Gender from 0=male to 1=female

Age in years

Financial deprivation from low deprivation to high deprivation

Social status from 1=lowest place in society to 10=highest place in society

For the **NVS-Test**, measuring functional health literacy based on document literacy and numeracy, these indicators together account for more than 21% of the total variance of functional health literacy (see Table 16), which is remarkably more than they explain for the HLS-EU-Q general health literacy index. One way to interpret the lower predictive power for HL measured by the HLS-EU-Q is that the variation of this index is influenced stronger by situational factors than the variation of the NVS-test, which measures personal competence more purely. Therefore the individual socio-demographic and socio-economic indicators explain less variance. The relative importance of the five indicators is different for the NVS-Test for the total sample. **Age** (beta=-.23) and **education** (beta=.23) are more important, **social status** (beta = .16) on place 3 somewhat less, **financial deprivation** (beta= -.07) on place 4 is even less important, and **gender** again holds place 5, with an even lower beta= .04. Variation by country is pronounced, for age between beta= -.10 (Ireland) and beta= -.42 (Netherlands), for education between beta= .15 (Austria) and beta= .3 (Greece) or beta= .29 (Netherlands), for social status from beta= .24 (Poland) to beta= .22 (Ireland), for financial deprivation from beta= .00 (Greece) to beta= -.15 (Austria) and for gender from beta= .01 (Germany) to beta= .12 (Poland).

The descriptive results and further information on the **self-assessed health** indicator used in the third model (Table 17), are presented in the section: 9.3 Self-Assessed Health Status: Self-Assessed Health, Long-term Illness and Limitations by Health Problems – Percentages and Associations (page 67). The model accounts with almost 25% for a quarter of the total variance of self-assessed health in the total sample. Compared to the models with the general health literacy index, or the NVS score as dependents, self-assessed health thus shows an even larger social gradient.

Table 17: Self-perceived Health by Multiple Predictors (beta weight and adjusted Rsquare) for Countries and Total

| Self-perceived Health by... | Austria | Bulgaria | Germany | Greece | Spain | Ireland | Netherlands | Poland | Total |
|--------------------------------|--------------------|--------------------|--------------------|-------------------|--------------------|-------------------|--------------------|--------------------|-------|
| Gender | .037 ^a | .043 ^a | -.022 ^a | .034 ^a | .075 | .009 ^a | .031 ^a | -.032 ^a | .028 |
| Age | .479 | .514 | .325 | .531 | .407 | .251 | .152 | .463 | .392 |
| Education (Isced level) | -.025 ^a | -.022 ^a | -.048 ^a | -.108 | -.044 ^a | -.158 | -.026 ^a | .007 ^a | -.065 |
| Financial deprivation | .189 | .143 | .254 | .119 | .116 | .089 | .096 | .229 | .113 |
| Social status | -.023 ^a | -.066 ^a | -.063 ^a | -.085 | -.038 ^a | -.096 | -.186 | -.157 | -.140 |
| Adj. R square | .284 | .369 | .192 | .447 | .222 | .140 | .079 | .418 | .249 |

AT [N=892] BG [N=918] DE(NRW) [N=975] EL [N=964] ES [N=958] IE [N=878] NL [N=971] PL [N=896] TOTAL [7452]

a...not significant on the 0,05 level

Self-perceived health from 1=very good to 5=very bad

Gender from 0=male to 1=female

Age in years

Financial deprivation from low deprivation to high deprivation

Social status from 1=lowest place in society to 10=highest place in society

The most important of all 5 predictor variables for self-assessed health is **age**, where older people clearly indicate worse health than younger ones. Age is here again less important for the Netherlands (beta= .15) and Ireland (beta= .25) in comparison to the other countries. **Social status**, with a beta weight of beta= -.14, is the second most important predictor of self-assessed health in the total sample. Beta weights range from beta= -.02 in Austria to beta= -.16 in Poland and beta= -.19 in the Netherlands. **Financial deprivation**, with a beta weight of beta=.11, is the third socio-demographic predictor of self-assessed health in the total sample. In Austria, Bulgaria, Germany and Spain it's even more important than social-status. **Education**, with a beta weight of beta= -.65, has only small influence on self-perceived health, where better educated people tend to feel a little healthier than less educated. Ireland (beta = -.16) and Greece (beta= -.11) are the only countries with a significant association on the country level. The least important of the 5 predictor variables is again **gender**, with a small beta weight of beta=.03 in the total sample indicating, that females assess their health a little worse than men. However, this effect is like the education effect too small, to be significant on the country level.

8 Which Populations Are Specifically Vulnerable by Showing High Proportions of Limited Health Literacy?

A number of subpopulations could be identified by the HLS-EU survey showing an over proportionally high likelihood for limited (inadequate or problematic) health literacy, as measured by the general-HL index. All subgroups in Table 18 are larger than 5% of the total sample and have with more than 60% very high shares of individuals with limited health literacy. Populations with a low self-perceived social status (73.9%), bad self-assessed health status (72.8%), low education (68.0%), suffering from financial deprivation (67.1%), having severe health related limitations of daily life (65.6%), age of 76 years or older (60.8%), or with low self-assessed social status (60.0 %) are the most vulnerable, with large shares of individuals characterized by limited health literacy levels.

Table 18: Percentage of Individuals with Limited Literacy in Very Vulnerable Groups for Countries and Total

| INDICATOR | CATEGORY | AT % | BG % | DE % | EL % | ES % | IE % | NL % | PL % | TOT. % |
|--|----------------------------------|---------|---------|---------|---------|---------|---------|---------|---------|-----------|
| Social Status | Very Low | 78.5 | 79.7 | 58.7 | 79.6 | 84.3 | 64 | 49.9 | 59.9 | 73.9 |
| Self-perceived health | Bad; Very Bad | 86 | 82.8 | 56.5 | 83.3 | 77.8 | 55.6 | 41.2 | 71.7 | 72.8 |
| Education (Isced Level) | Level 0, Level 1 | 63.2 | 76.5 | 58.1 | 77.2 | 74.4 | 50.8 | 41.3 | 100 | 68 |
| Able to pay for medication | Very difficult | 77.6 | 81.2 | 40 | 66 | 55.2 | 59.8 | 57.5 | 61.9 | 67.1 |
| Able to afford doctor | fairly difficult, very difficult | 76.1 | 80.1 | 56.3 | 61.1 | 68 | 55.7 | 42.1 | 74.5 | 66.5 |
| Limited activities by health problems | Severely limited | 81.9 | 80.8 | 54.6 | 80 | 76.7 | 56.3 | 34.7 | 65.9 | 65.6 |
| Monthly household income | Less than €800 | 37.7 | 83.6 | 56.4 | 70.2 | 70.3 | 58.4 | 38.4 | 61.6 | 65.6 |
| Able to pay for medication | Fairly difficult | 66.6 | 71.7 | 65.8 | 59.6 | 71.7 | 51 | 35.5 | 67.5 | 63.6 |
| Difficulties paying bills | Most of the time | 67.1 | 75.1 | 46.7 | 60.7 | 61.7 | 61.2 | 33.5 | 42.2 | 63.4 |
| Long term illness | Yes more than one | 78.5 | 83.3 | 58.4 | 73.9 | 69.5 | 45.3 | 32.6 | 54.3 | 61 |
| Age | 76 or older | 72.6 | 75.4 | 53.9 | 72.3 | 71.1 | 46 | 28.8 | 65.4 | 60.8 |
| Social Status | Low | 59.4 | 62.1 | 63.9 | 57.4 | 59.2 | 53.3 | 48.4 | 63.8 | 60 |

There are remarkable differences in the order of 15 % up to 35 % depending on indicator between the percentage values of limited HL for the different countries, where the Netherlands show relatively smallest shares of individuals with limited health literacy for almost all indicators.

Table 19: Percentage of Individuals with Limited Literacy in Vulnerable Groups for Countries and Total

| INDICATOR | CATEGORY | AT % | BG % | DE % | EL % | ES % | IE % | NL % | PL % | TOT. % |
|--|--------------------------------------|------|------|------|------|------|------|------|------|--------|
| Self-perceived health | Fair | 76.6 | 65.4 | 59.2 | 60.9 | 68.2 | 50.7 | 34.8 | 55.2 | 59.4 |
| Marital status | Widowed | 73.6 | 73.4 | 61 | 60.8 | 71 | 36.1 | 28.5 | 58 | 59.1 |
| Number of doctor visits (last 12 month) | 6 times or more | 69.9 | 74 | 56.2 | 58.4 | 69.4 | 46.7 | 30.8 | 54.1 | 58.8 |
| Limited activities by health problems | Limited but not severely | 70.7 | 80.5 | 59.3 | 59.9 | 64 | 40.5 | 32.6 | 55.4 | 58.2 |
| Age | between 66 and 75 | 71.4 | 79.7 | 39.7 | 66.2 | 77.1 | 37.1 | 30.4 | 58.7 | 58.1 |
| Main status of employment | In retirement or early retirement | 69 | 78.4 | 45.6 | 60.3 | 69.2 | 31.5 | 29.7 | 60.2 | 57.8 |
| Monthly household income | €800 to under €1,350 | 58.7 | 70 | 57.5 | 55.1 | 59.4 | 57.7 | 32.4 | 63.6 | 57.7 |
| Education (ISCED Level) | Level 2 | 69.7 | 77.5 | 57 | 55.8 | 59.7 | 52 | 35.1 | 59.6 | 57.2 |
| Main status of employment | Unemployed | 44.4 | 75.4 | 57.3 | 55.5 | 60.4 | 46.4 | 27.2 | 39.6 | 55.4 |
| Long term illness | Yes one | 63.6 | 73.6 | 51.1 | 56.2 | 65 | 45.7 | 32 | 58.7 | 55.2 |
| Able to afford doctor | Fairly easy | 64.6 | 64.2 | 62.6 | 42.8 | 68.1 | 37.8 | 44.3 | 53.5 | 54.2 |
| Difficulties paying bills | From time to time | 63.3 | 60.6 | 65 | 45.7 | 57.2 | 48.9 | 33.1 | 53.4 | 53.2 |
| Number of emergency service contacts (last 24 month) | 3 times or more | 88.6 | 70.8 | 55.2 | 65.2 | 63.8 | 44.9 | 30.7 | 50 | 53.2 |
| Social Status | Lower middle | 60.3 | 57.9 | 43.2 | 51.9 | 57.4 | 53.9 | 40.2 | 53.3 | 53.1 |
| Number of hospital stays (last 12 month) | 3 times or more | 86.4 | 80 | 57.1 | 51.7 | 68.8 | 47.1 | 31.3 | 47.6 | 53 |
| Alcohol use | No alcohol consumption | 64.5 | 69.2 | 48.4 | 55.9 | 60.3 | 37.4 | 28.2 | 46.7 | 52.8 |
| Having peers to come with when visiting a doctor | No | 55.7 | 70.6 | 46.7 | 48.7 | 63.4 | 38.8 | 36.3 | 53.9 | 52.1 |
| Monthly household income | €1,350 to under €1,850 | 65.3 | 63.3 | 56.6 | 40.5 | 57.5 | 40.8 | 33.3 | 55.3 | 52.1 |
| Kind of health insurance | Public | 57.5 | 62.3 | 48.9 | 45.2 | 58.1 | 47.6 | 33 | 45.3 | 51.9 |
| Number of visits to other health professionals (last 12 month) | 0 | 52 | 63.8 | 41 | 52.1 | 59.1 | 45.4 | 31.3 | 49.5 | 51.9 |
| Number of emergency service contacts (last 24 month) | 1 - 2 times | 60.1 | 70.3 | 59.3 | 53.9 | 63 | 40.3 | 27.7 | 46.4 | 51.4 |
| Main status of employment | Full-time homemaker, parent or carer | 73.6 | 60.6 | 46.5 | 55.9 | 68.2 | 43.9 | 35 | 35.4 | 50.8 |
| Number of hospital stays (last 12 month) | 1 - 2 times | 64 | 71.2 | 55.4 | 52.5 | 62.4 | 38.7 | 28.1 | 55.9 | 50.7 |
| Body Mass Index Group | Overweight | 60.3 | 62.1 | 55.7 | 50.8 | 56.7 | 41.1 | 28.4 | 44.2 | 50.2 |
| Active community Involvement | Not at all | 57.9 | 64.7 | 49.3 | 45.2 | 61.1 | 43 | 31.7 | 47 | 50.1 |
| Age | between 56 and 65 | 65.8 | 75.2 | 39.7 | 52.1 | 60.5 | 35.7 | 23.9 | 46.8 | 50.1 |

Table 19 presents groups that still are over proportional likely (more than 50% less than 60%) to have limited literacy in the total sample. The answer patterns for the national samples again show remarkable diversity especially for the 66 to 75 years cohorts (difference of nearly 50 %) and for populations with increased numbers of hospital visits (difference of more than 50%).

9 What Are the Consequences of Limited Health Literacy for Health Behaviours and Risks, Self-Assessed Health Status and Health Service Use?

Consequences of low or limited health literacy are frequently discussed in the international literature^{29 30} on health literacy and in guides on health literacy³¹. The available empirical evidence primarily based on patient studies, while data for general populations are rare. The most discussed consequences of limited HL are: health behaviours, health risks, health outcomes and health care use and costs³². Therefore in the HLS-EU model (see Figure 1: The HLS-EU Conceptual Model of Health Literacy (Sorensen et al. 2012)p.7), some of the main consequences were integrated, and few indicators for three selected clusters of consequences have been measured by the HLS-EU survey: health behaviour and health risks, self-assessed health status and health service use. In the following sections first univariate distributions of these indicators are presented, which then will be used for analysis by bivariate correlations and multivariate models with general health literacy as a predictor variable.

²⁹ Andrus M.R., Roth M. T., 2012: Health Literacy: A Review, *Pharmacotherapy: The Journal of Human Pharmacology and Drug Therapy* 22(3):282-302

³⁰ Paasche-Orlow M.K, Parker R. et al., 2005: The prevalence of limited literacy. *J Gen Intern Med.* 2005 February; 20(2): 175–184.

³¹ <http://www.health.gov/communication/literacy/quickguide/>

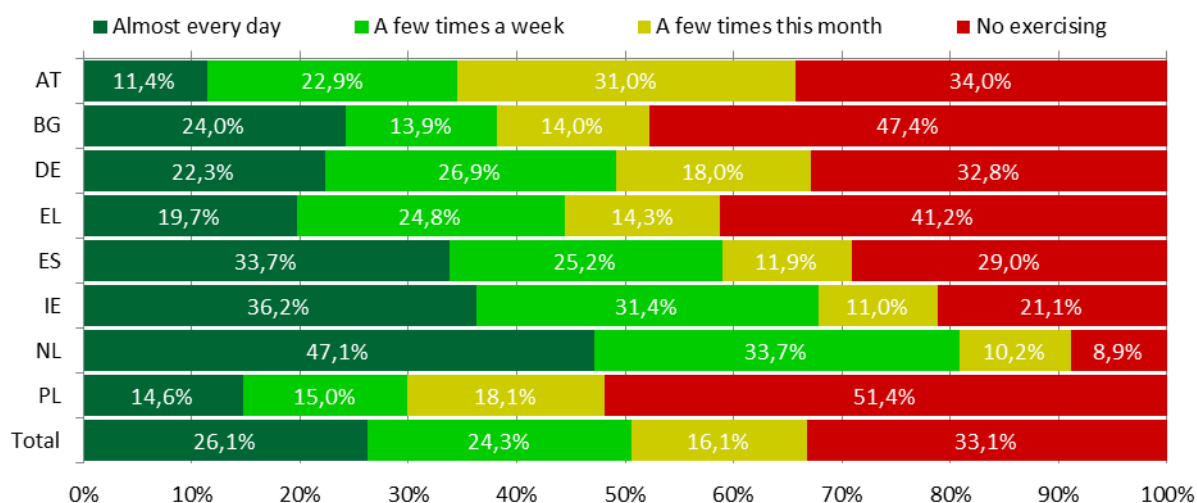
³² Berkman ND, Sheridan SL, Donahue KE, Halpern DJ, Viera A, Crotty K, Holland A, Brasure M, Lohr KN, Harden E, Tant E, Wallace I, Viswanathan M. Health Literacy Interventions and Outcomes: An Updated Systematic Review. Evidence Report/Technology Assessment No. 199. (Prepared by RTI International–University of North Carolina Evidence-based Practice Center under contract No. 290-2007-10056-I. AHRQ Publication Number 11-E006. Rockville, MD. Agency for Healthcare Research and Quality. March 2011.

9.1 Health Behaviours and Health Risks: Physical Exercising, Alcohol, Smoking and BMI – Percentages and Associations

Health Behaviours and Health Risks: Physical Exercising, Alcohol, Smoking and BMI – Percentages and Associations

Physical exercising patterns vary greatly across countries (Graph 36). That holds true for both extreme categories: In total 26.1% stated to exercise every day, a share which varies between 11.4% for Austria and 47.1% for the Netherlands, while the percentage of respondents indicating not to exercise at all, in total 33.1%, ranges from 8.9% for the Netherlands to 51.4% for Poland .

Graph 36: Percentages for Frequency of Physical Exercising³³ for Countries and Total



AT [N=1013] | BG [N=1003] | DE (NRW) [N=1056] | EL[N=1000] | ES[N=1001] | IE[N=1005] | NL[N=1023] | PL[N=1001] | TOTAL[N=8102]

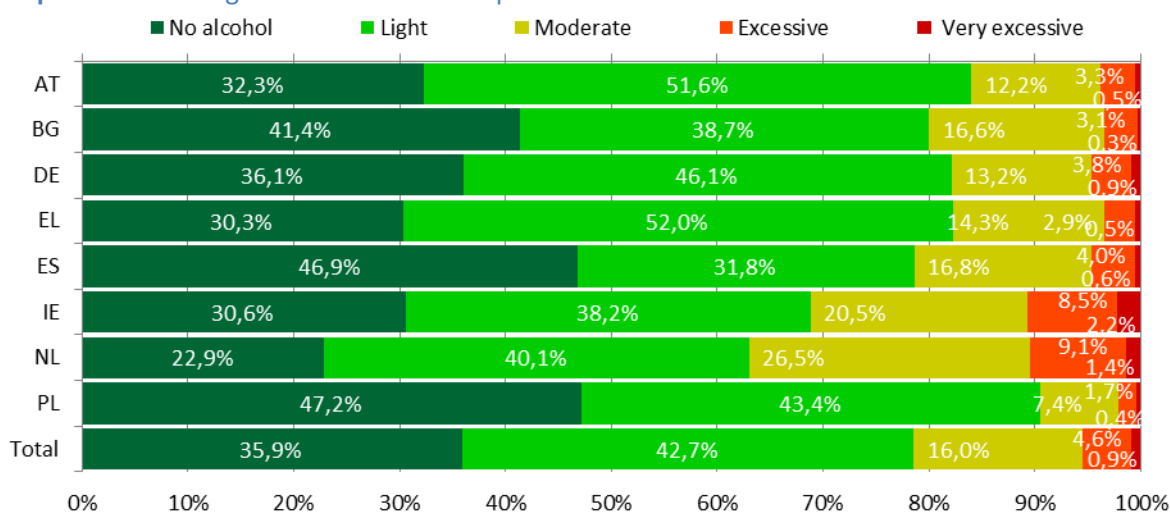
*only NRW

³³ Q14 - How often during the last month did you exercise for 30 minutes or longer e.g. running, walking, cycling? (1) Almost every day (2) A few times a week (3) A few times this month (4) Not at all (5) I haven't been able to exercise (SPONTANEOUS) (5) DK (SPONTANEOUS) → due to small percentages for two of the original categories, categories were regrouped - the categories 'not at all' and 'haven't been able to exercise' were summed up to the category 'no exercise'

Self-reported **alcohol drinking behaviour** was measured by 5 questions³⁴. An ordinal variable (Garretsen Index) was computed following a quantity-frequency (QF) approach³⁵. The variable classifies respondents in five categories (very excessive alcohol consumers, excessive alcohol consumers, moderate alcohol consumers, light alcohol consumers and no alcohol consumers). The classification is based on the number of drinking occasions per month and the number of alcoholic drinks consumed on average per sitting (see appendix for classification table). Following Garretsen's³⁶ coding procedure ordinal intervals were recoded in relation to their respective maximum.

A majority of 59 % of respondents in the total sample indicated light or moderate drinking. 36% of the total sample indicated, that they didn't drink any alcohol in the last month. On the other hand a minority of 5.5% stated excessive and very excessive drinking behaviour. There is pronounced country wise variation for the category 'no alcohol': with the lowest share in the Netherlands (22.9%) and highest in Spain (46.9%) and for excessive and very excessive drinking, ranging from 2.1% for Poland to 10.5% for Ireland and Greece. (Graph 37)

Graph 37: Percentages of Alcohol Consumption for Countries and Total³⁷



AT [N=940] | BG [N=983] | DE (NRW) [N=1026] | EL[N=996] | ES[N=985] | IE[N=990] | NL[N=1000] | PL[N=952] | TOTAL[N=7872]

*only NRW

³⁴ Q9 - During the past 12 months, did you drink any alcoholic beverage (beer, wine, spirits, cider or other local beverages)? (1)Yes (2) No (3) DK (SPONTANEOUS) | Q10 - How often in the past 12 months have you had 5 or more drinks on one occasion? (1) Several times a week (2) Once a week (3) Once a month (4) Less than once a month (5) Never (6) DK (SPONTANEOUS) | Q11 - Did you drink any alcoholic beverages (beer, wine, spirits, cider or other local beverages) in the last 30 days? (1) Yes (2) No (3) DK (SPONTANEOUS) | Q12 - In the last 30 days, how many times did you drink any alcoholic beverages? (1) Daily (2) 4 – 5 times a week (3) 2 – 3 times a week (4) Once a week (5) 2 – 3 times a month (6) Once (7) Don't remember\ Refusal (SPONTANEOUS) | Q13 - On a day when you drink alcoholic beverages, how much do you usually drink? (1) Less than 1 drink (2) 1-2 drinks (3) 3-4 drinks (4) 5-6 drinks (5) 7-9 drinks (6) 10 or more drinks (7) It depends (SPONTANEOUS) (8) Don't remember\ Refusal (SPONTANEOUS)

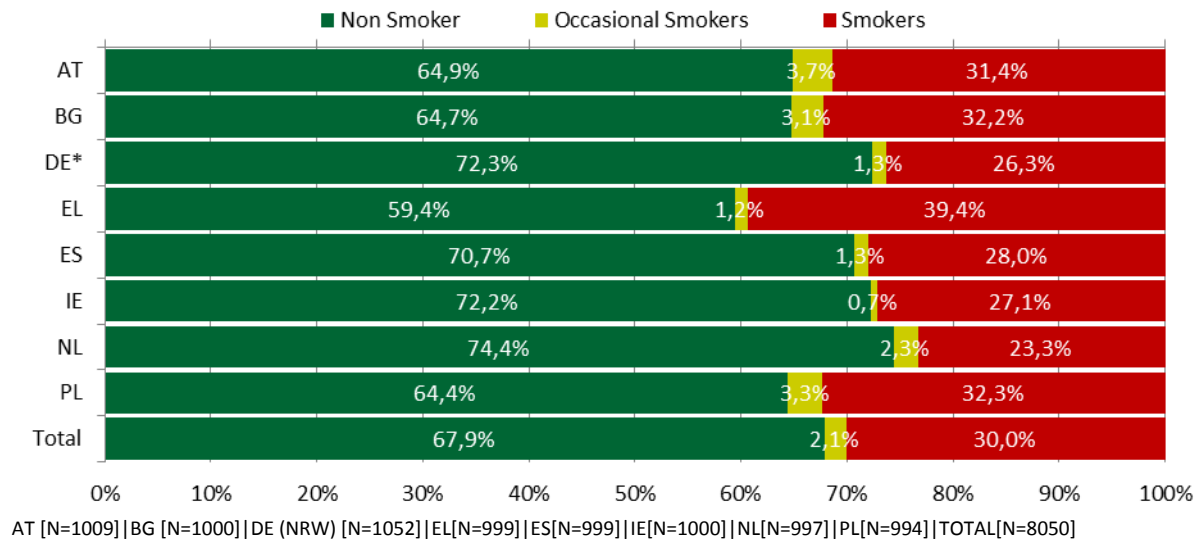
³⁵ Dawson D., 2003: Methodological Issues in Measuring Alcohol Use. Available from: <http://pubs.niaaa.nih.gov/publications/arh27-1/18-29.htm>

³⁶ Garretsen HFL., 1983: Probleemdrinken: Prevalentiebepaling, beïnvloedende factoren en preventiemogelijkheden: Theoretische overwegingen en onderzoek in Rotterdam. Lisse, Swets & Zeitlinger, 1983 (in Dutch); Garretsen HFL and Knibbe RA. Alcohol Prevalentie Onderzoek Rotterdam/ Limburg, Landelijk Eindrapport, Ministerie van Welzijn, Volksgezondheid en Cultuur, Leidschendam 1983 (in Dutch)

³⁷ For comparison it is important to note: The item surveyed the number of drinks and not the amount of alcoholic beverages, a measurement which may differ in each country. Although this measurement was specified in a note to the interviewer (one drink= 1 glass of wine (15cl) or 1 can/bottle of beer or cider (33cl) or 4cl spirit), it was not part of the question.

Smoking³⁸ as typical risk behaviour, was as well surveyed. In total a majority of 67.9% of the respondents indicated that they never smoke, 2.1% that they smoke occasionally and 30.0% that they smoke every day. The share of every day smokers varies considerably from the lowest percentage in the Netherlands (23.3%) to the highest in Greece (39.4%).

Graph 38: Percentages for Extend of Smoking³⁹ for Countries and Total



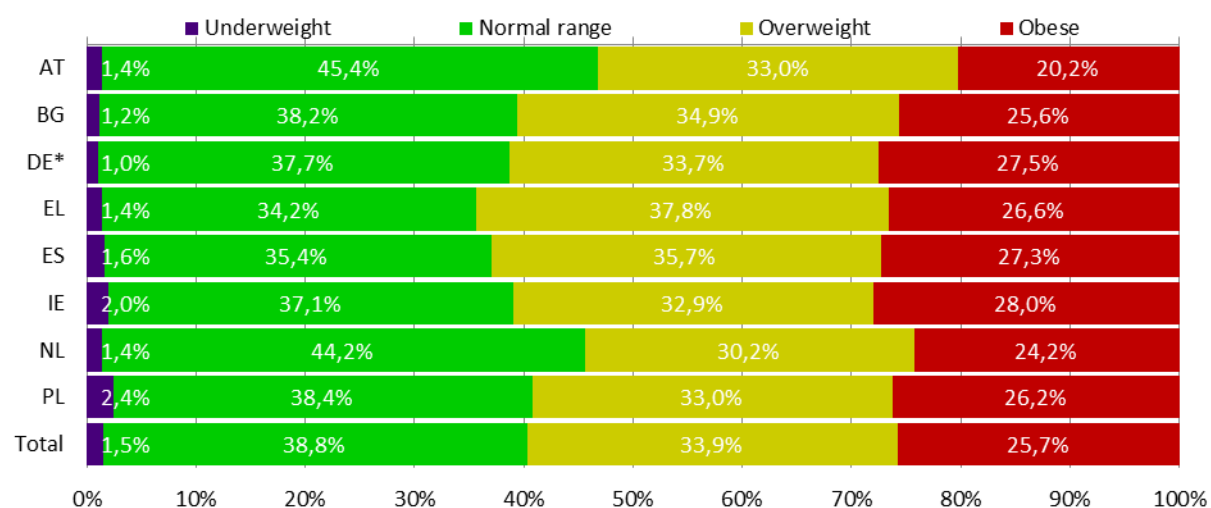
³⁸ Item Q8: Do you use the following tobacco products every day, occasionally or not at all?

³⁹ Q7, Q8_1 and Q8_2 were summarized to one smoking habits variable. Q7 - Regarding smoking cigarettes, cigars or a pipe, which of the following applies to you? (1) You smoke at the present time (2) You used to smoke but you have stopped (3) You have never smoked (4) DK (SPONTANEOUS) Q8_1 Do you use manufactured cigarettes (1) every day (2) occasionally or (3) not at all? Q8_2 Do you use hand-rolled cigarettes (1) every day (2) occasionally or (3) not at all?

The **Body-Mass-Index** (BMI), according to the WHO classification⁴⁰ is an index of weight-for-height that is commonly used to classify underweight, overweight and obesity in adults. It is defined as the weight in kilograms divided by the square of the height in metres (kg/m²). It was calculated by the answers on the questions on self-assessed weight and heights included in the questionnaire.

Of the total sample 1.5% of respondents are underweight, ranging from 1% in Germany to 2.3% in Poland. 38.8% are within the normal range with the lowest share in Greece (34.2%) and highest share in Austria (45.4%) more than a third (from 30.2% for the Netherlands to 37.8% for Greece) are classified as overweight and about every fourth person as obese (from 20.2% for Austria to 28% for Ireland) (Graph 39)

Graph 39: Percentages for Ranges of Body-Mass-Index (BMI)⁴¹ for Countries and Total



AT [N923] | BG [N=970] | DE (NRW) [N=981] | EL [N=997] | ES[N=946] | IE[N=996] | NL[N=1009] | PL[N=964] | TOTAL[N=7757]

*only NRW

⁴⁰ WHO 2012: BMI classification. Available from: http://apps.who.int/bmi/index.jsp?introPage=intro_3.html

⁴¹ Calculated: How tall are you? (Approximately) & How much do you weigh? (Approximately). The BMI was only calculated if height and weight were reported otherwise it was coded as missing value

Correlations between these indicators for health behaviours and health risks are rather low (see Table 20). In the total sample (for national level see appendix) frequency of physical exercising is significantly correlated with BMI ($r = .12$) and Alcohol consumption ($r = -.11$) and smoking habits ($r = .08$). Smoking and alcohol consumption as well as smoking and BMI ($r = .18 / r = -.05$) are also significantly correlated. Alcohol consumption and BMI are not significantly associated.

Table 20: Spearman's Rho Correlations between Lifestyle and Behavior Indicators for Total

| | | Physical exercising | Alcohol consumption | Smoking | BMI |
|---------------------|---|---------------------|---------------------|---------|------|
| Physical exercising | r | 1 | | | |
| | N | 8565 | | | |
| Alcohol consumption | r | -.113** | 1 | | |
| | N | 8333 | 8334 | | |
| Smoking | r | .079** | .182** | 1 | |
| | N | 8513 | 8285 | 8513 | |
| BMI | r | .118** | -0.013 | -.050** | 1 |
| | N | 8188 | 7986 | 8142 | 8189 |

** . Correlation is significant at the 0.01 level (2-tailed);* . Correlation is significant at the 0.05 level (2-tailed).

9.2 How is Health Literacy Associated with Health Behaviours and Health Risks? Physical Activities, Alcohol, Smoking and BMI

Bivariate analysis of the general health literacy index and the health behaviour and health risk indicators (see Table 21) confirmed mostly weak, and for smoking habits even insignificant correlations for the total sample. As exception a relatively strong significant correlation in the European sample was found for the frequency of physical exercising $r = -.19$, but varying on national levels between $r = -.04$ for Spain and $r = -.21$ for Greece.

Table 21: Spearman Correlations between General Health Literacy and Indicators for Health Behaviour and Health Risks for Countries and Total

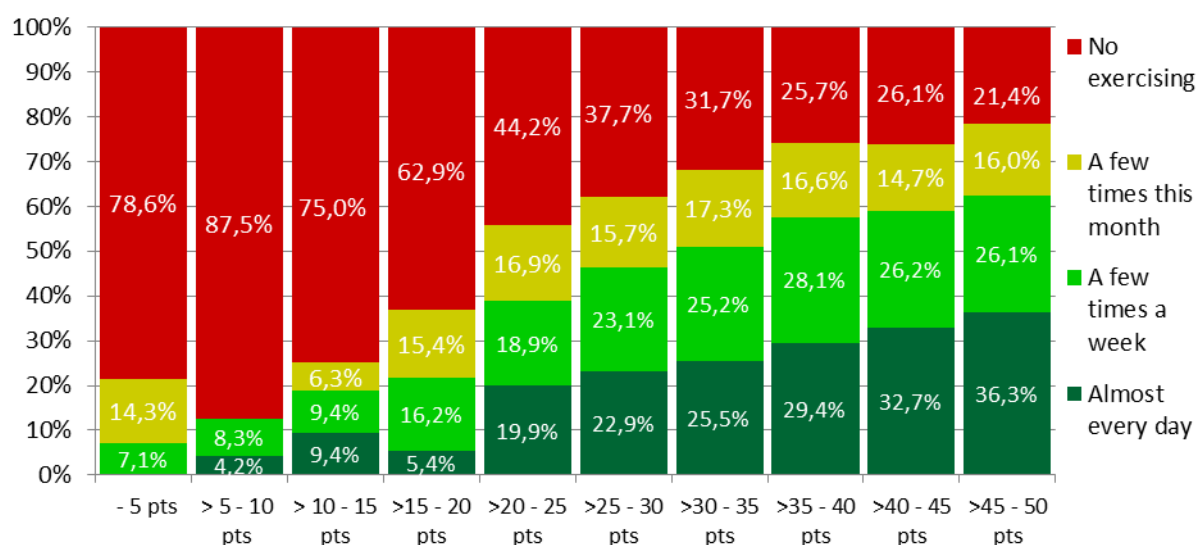
| General Health Literacy.... | | AT | BG | DE (NRW) | EL | ES | IE | NL | PL | TOTAL |
|-----------------------------|---|---------|---------|----------|---------|-------|---------|--------|---------|---------|
| Smoking | r | -.013 | .134** | -.068* | .081** | .005 | -.110** | .028 | -.032 | -.009 |
| | N | 1001 | 1005 | 1154 | 1042 | 1007 | 967 | 970 | 1038 | 8181 |
| Alcohol consumption | r | 0.044 | .098** | -.023 | .160** | .06 | -.053 | -.016 | .073* | .065** |
| | N | 941 | 987 | 1133 | 1038 | 996 | 957 | 970 | 1008 | 8030 |
| Physical exercising | r | -.187** | -.133** | -.206** | -.213** | -.043 | -.155** | -.079* | -.137** | -.189** |
| | N | 1006 | 1005 | 1161 | 1043 | 1009 | 972 | 992 | 1044 | 8232 |
| BMI*** | r | -.127* | -.057 | -.064 | -.120** | -.055 | .031 | -.038 | -.080 | -.066** |
| | N | 914 | 976 | 1078 | 1039 | 958 | 934 | 980 | 1009 | 7888 |

** Correlation is significant at the 0.01 level (2-tailed). * Correlation is significant at the 0.05 level (2-tailed).

***For BMI the metric variable was used.

The strong bivariate correlation of **physical exercising** with health literacy is reflected by the change of group percentages over various health literacy intervals. For the three lowest (5 point) intervals of general health literacy in the total sample more than 75% don't exercise at all, this rate reduces rather continuously to around 20% for the highest interval of health literacy (Graph 40).

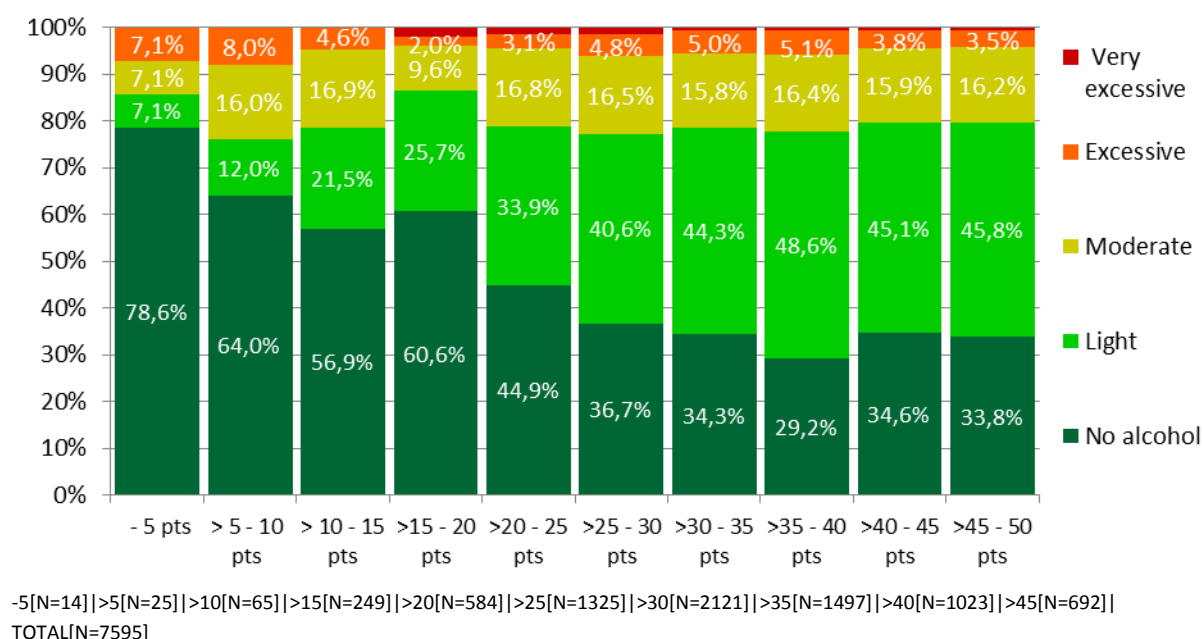
Graph 40: Frequency Of Physical Exercising by General Health Literacy Index (categorized in 5 pts. steps) for Total



-5[N=14] | >5[N=24] | >10[N=64] | >15[N=259] | >20[N=599] | >25[N=1351] | >30[N=3191] | >35[N=1534] | >40[N=1048] | >45[N=705] | TOTAL[N=7789]

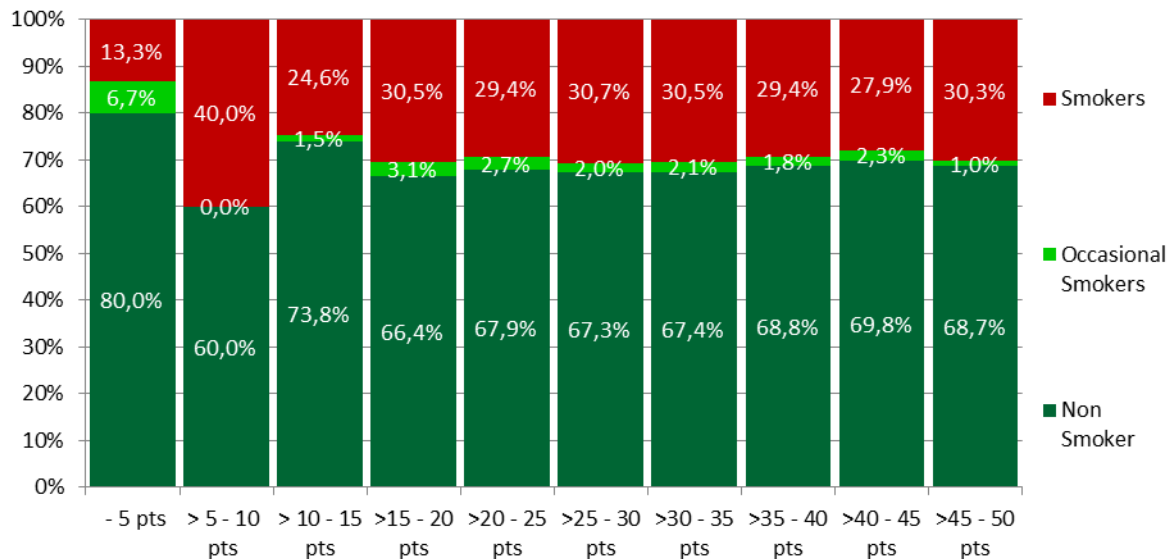
The effect of general health literacy on **alcohol consumption** for the total sample is significant, but much weaker $r = .07$ (Table 21). The proportion for the category 'no alcohol' is decreasing from more than 3/4 for individuals with low literacy to 1/3 for individuals with adequate or excellent health literacy (see Graph 41). Variations by countries are considerable, with no significant correlations for the Netherlands, Germany, Austria, Ireland and Spain, but significant ones for Poland ($r = .07$), Bulgaria ($r = .1$) and Greece ($r = .16$) (see Table 21).

Graph 41: Alcohol Drinking Patterns by General Health Literacy Index (categorized in 5 pts. steps) for Total



For the total sample no effect of health literacy on actual **smoking behaviour** can be demonstrated (see Table 21). On national level effects are significant, but differently directed: in Bulgaria ($r = .13$) and Greece ($r = .08$) there are significant positive associations, in Ireland ($r = -.11$) and Germany ($r = -.07$) significant negative ones (see Table 21).

Graph 42: Smoking Habits by General Health Literacy Index (categorized in 5 pts. steps) for Total

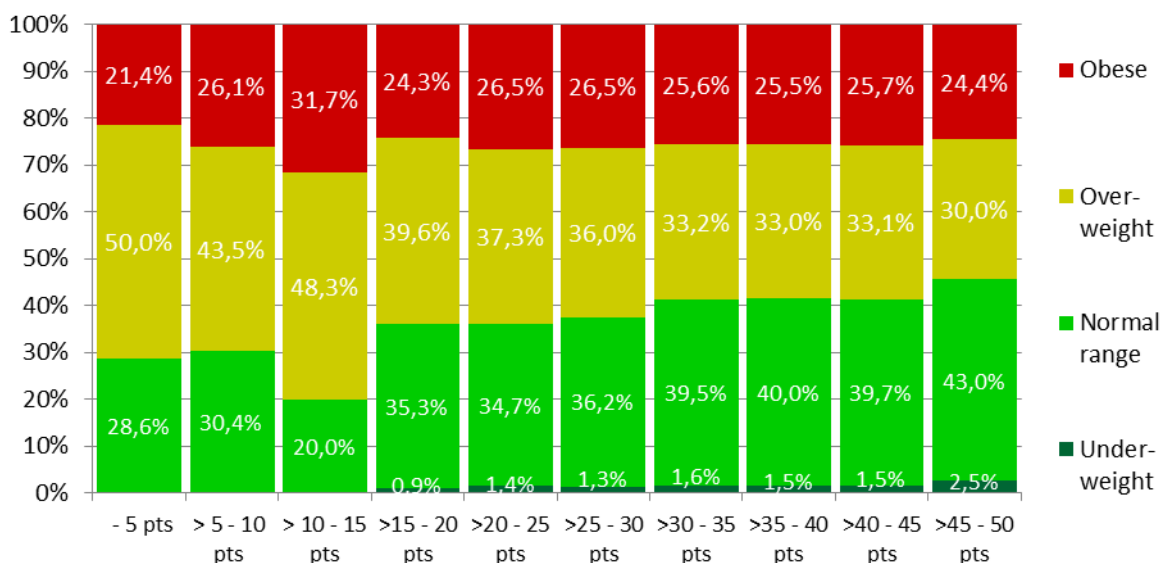


-5[N=15] | >5[N=25] | >10[N=65] | >15[N=259] | >20[N=598] | >25[N=1341] | >30 [N=2177] | >35[N=1519] | >40[N=1043] | >45 [N=699] |
TOTAL [N=7741]

The effects of health literacy on smoking behaviour thus are weak, adverse and overall unreliable. While more literate individuals seem to smoke less in some countries, they seem to smoke more in others. The different directions of the effect are very likely caused by intervening variables like age, social status or financial deprivation.

In the total sample general health literacy has a small but significant effect on the distribution of **BMI** categories, demonstrating that individuals with higher general health literacy scores are more likely to have a BMI within the 'normal range'. However, the proportion of obese individuals, who carry the highest health risk, is not decreasing with increasing health literacy levels (see Graph 43). The correlation in the total sample is small but significant ($r = -.07$), but on the national level is significant only for two countries, for Austria ($r = -.13$) and Greece ($r = -.12$) (Table 21).

Graph 43: BMI Categories by General Health Literacy Index (categorized in 5 pts. steps) for Total



-5[N=14] | >5[N=23] | >10 [N=60] | >15[N=235] | >20[N=573] | >25 [N=1297] | >30[N=2094] | >35[N=1490] | >40[N=1020] | >45[N=699] |
TOTAL[N=7475]

In general health literacy has small bivariate correlations with health behaviour and health risk indicators. The effects on alcohol consumption, smoking and BMI are either unreliable, insignificant or don't apply to the sub-populations who are most at risk. Physical activity is the exception; there is a considerable and stable association between frequency of physical activity and general health literacy in all countries (except Spain) and the total sample, indicating that individuals with more health literacy exercise more often.

9.3 Self-Assessed Health Status: Self-Assessed Health, Long-term Illness and Limitations by Health Problems – Percentages and Associations

Three dimensions of health status were measured: self-assessed health, long-term illness and limitations by health problems. These three questions on health status are based on the Minimum European Health Module (MEHM)⁴², which has been included in a number of national surveys, is part of the European Health Interview Survey (EHIS), the Eurobarometer and the EU-Statistics on Income and Living Conditions (EU-SILC) instrument. The MEHM is used by Eurostat for the calculation of the Health Life Years indicator (HLY)⁴³. All three items therefore are accepted indicators for measuring health status in population surveys.

The question on self-assessed health is based on WHO⁴⁴ recommendations. Self-assessed health was measured on a scale with the categories 1=very good, 2=good, 3=fair, 4=bad and 5=very bad, and shows a differentiated picture in the 8 countries. The total mean is 2.2. The Irish (1.8), the Greek (1.9) and the Austrian (2.0) respondents rated their health substantially better, while mainly the Bulgarians (2.6) rated their health poorer (see Graph 44)

⁴² De Palma E, Cialesi R., 2003: Comparative Analysis of Minimum European Health Module and Questions Used in Europe. Rome: ISTAT Available from: <http://www.handicapincifre.it/europa/Mehm.pdf>

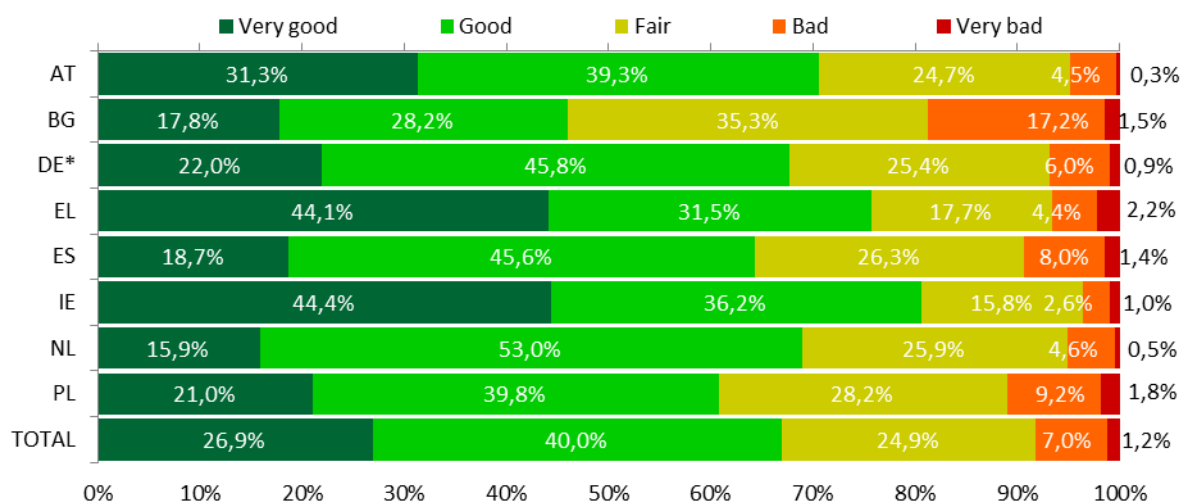
European health expectancy monitoring unit (EHEMU), 2010: Technical report 2010-4.6. The Minimum European Health Module. Background Documents. Available from: http://www.eurohex.eu/pdf/Reports_2010/2010TR4.6_Health%20Module.pdf

⁴³ Eurostat, 2011: Healthy life years statistics. Available from: http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Healthy_life_years_statistics

⁴⁴ WHO-Euro, 1996: Health Interview survey. Towards international harmonization of methods and instruments: 51-53. Available from: http://www.euro.who.int/__data/assets/pdf_file/0017/111149/E72841.pdf

As far as the distribution of the self-assessed health is concerned: in the total sample 26.9% reported their health as very good, 40% as good, 24.9% as fair and 8.2% as bad or very bad. Overall the group of respondents reporting their health as good was the largest group in the sample (40.0%) and only 1.2% declared to have very bad health (see Graph 44).

Graph 44: Percentages, Means and Standard Deviations of Self-Assessed Health⁴⁵ for Countries and Total



AT [N=1010] | BG [N=998] | DE (NRW) [N=1055] | EL[N=999] | ES[N=1000] | IE[N=1006] | NL[N=1022] | PL[N=993] | TOTAL[N=8093]

*only NRW

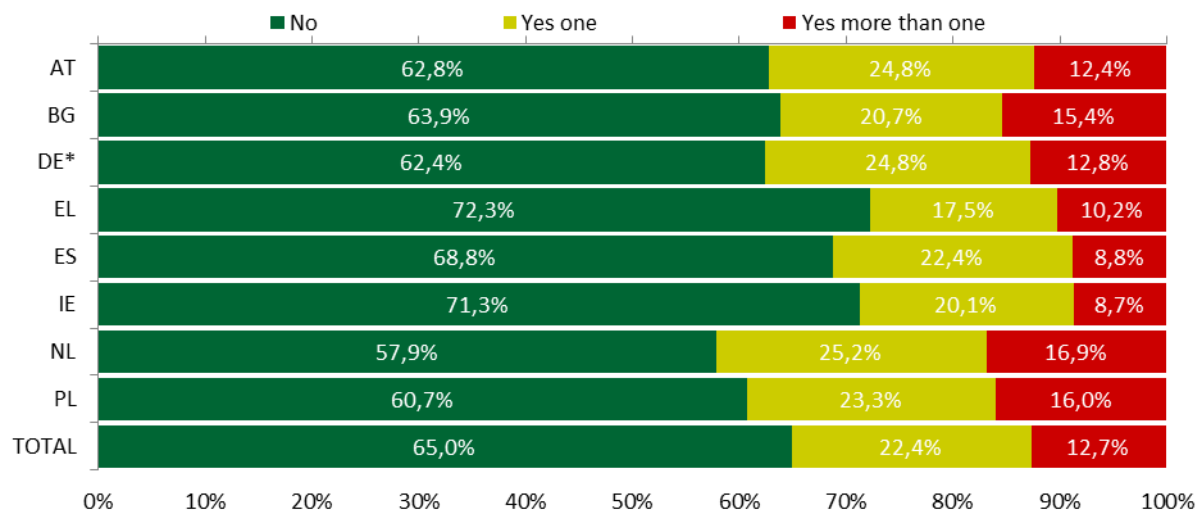
| AT | BG | DE* | EL | ES | IE | NL | PL | Total |
|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| Ø2.0 | Ø2.6 | Ø2.2 | Ø1.9 | Ø2.3 | Ø1.8 | Ø2.2 | Ø2.3 | Ø2.2 |
| SD 0.9 | SD 1.0 | SD 0.9 | SD 1.0 | SD 0.9 | SD 0.9 | SD 0.8 | SD 1.0 | SD 1.0 |

By country there is considerable variation, especially for the extreme categories: The share of respondents reporting to be in very good health ranges from 15.9% in the Netherlands to 44.4% in Ireland. The proportion of vulnerable respondents reporting a 'bad' or 'very bad' health status increases from 4.4% in Greece to 18.7% in Bulgaria. (Associations of self-assessed health with relevant socio-demographic and socio-economic indicators have already been assessed in section 7: How Important Is the Social Gradient for Health Literacy, Functional Health Literacy (NVS) and Self-Perceived Health? Page 51)

⁴⁵ How is your health in general? (1)Very good (2)Good (3)Fair (4)Bad (5)Very bad (6) DK/ Refusal (SPONTANEOUS)

The second item measuring health status asked for **long-term illnesses or health problems** which have lasted at least 6 months.

Graph 45: Percentages of Long-term Illness⁴⁶ for Countries and Total



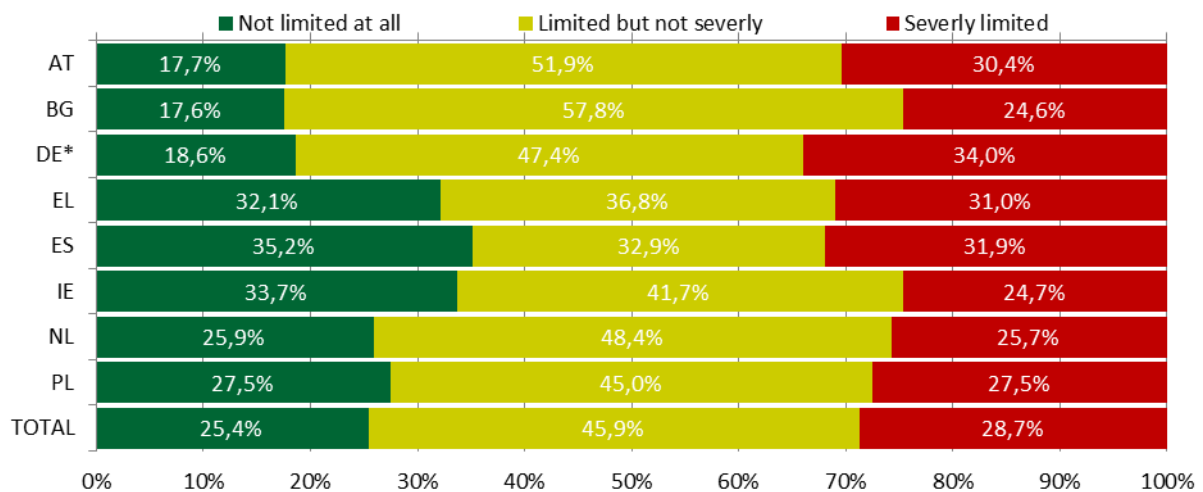
AT [N=1001] | BG [N=1000] | DE (NRW) [N=1055] | EL[N=1000] | ES[N=996] | IE[N=1002] | NL[N=1019] | PL[N=993] | TOTAL[N=8066]

*only NRW

Nearly two thirds of all respondents reported no long-term illness (ranging from 57.9% in the Netherlands to 72.3 % in Greece), 22.4% stated one long-term illness and 12.7% more than. While for Greece only 27.7% indicated a long term health problem, and for Ireland only 28.8%, the Netherlands are outliers in the other direction – 42.1% indicated one or more long-term health problems (see Graph 45).

⁴⁶ Do you have any long-term illness or health problem? By long-term I mean problems which have lasted, or you expect to last, for 6 months or more? (1) Yes more than one (2) Yes one (3) No (4) DK/ Refusal (SPONTANEOUS)

Graph 46: Percentages of Limitations by Health Problems⁴⁷ for Countries and Total



AT [N=368] | BG [N=397] | DE (NRW) [N=358] | EL[N=389] | ES[N=277] | IE[N=310] | NL[N=288] | PL[N=428] | TOTAL[N=2815]

*only NRW

Only respondents with long-term illnesses were surveyed for **limitations** in their activities by their health problems. In the total sample of those with long term illnesses, more than 25% didn't feel limited at all, about 46% felt limited but not severely and about 29% felt severely limited by their health problems. Thus, more than 70% of all respondents felt limited in their usual activities, varying between 65% in Spain and 82% in Bulgaria and Austria.

As could be expected, the three indicators for health, in the total sample, are significantly and highly inter-correlated (see correlations for country level in appendix). The better the self-assessed health, the less long-term illnesses ($r = -.59$) or limitations ($r = -.45$) were reported. Long-term illnesses and limitations are correlated positively, but somewhat less ($r = .30$).

Table 22: Spearman's Rho Correlations between Self-Assessed Health Status Variables for Total

| | | Self-Assessed Health | Long-Term Illness | Limitations |
|----------------------|---|----------------------|-------------------|-------------|
| Self-Assessed Health | r | 1 | | |
| | N | 8548 | | |
| Long-Term Illness | r | -.589** | 1 | |
| | N | 8513 | 8527 | |
| Limitations | r | -.450** | .303** | 1 |
| | N | 3032 | 3043 | 3043 |

** . Correlation is significant at the 0.01 level (2-tailed).

⁴⁷ For at least the last 6 months, how much have your health problems limited the activities you would usually do? (1) Severely limited (2) Limited but not severely (3) Not limited at all (4) DK/ Refusal (SPONTANEOUS) – only participants with long-term illness were surveyed

9.4 How Is Health Literacy Associated With Self-Assessed Health Status Indicators? Self-Assessed Health, Long-Term Illness and Limitations by Health Problems

There is a significant association between lower general-HL and worse self-assessed health ($r = -.27$). Weaker but still significant associations with HL were found for health-related limitations ($r = .17$) and long-term illness ($r = .16$).

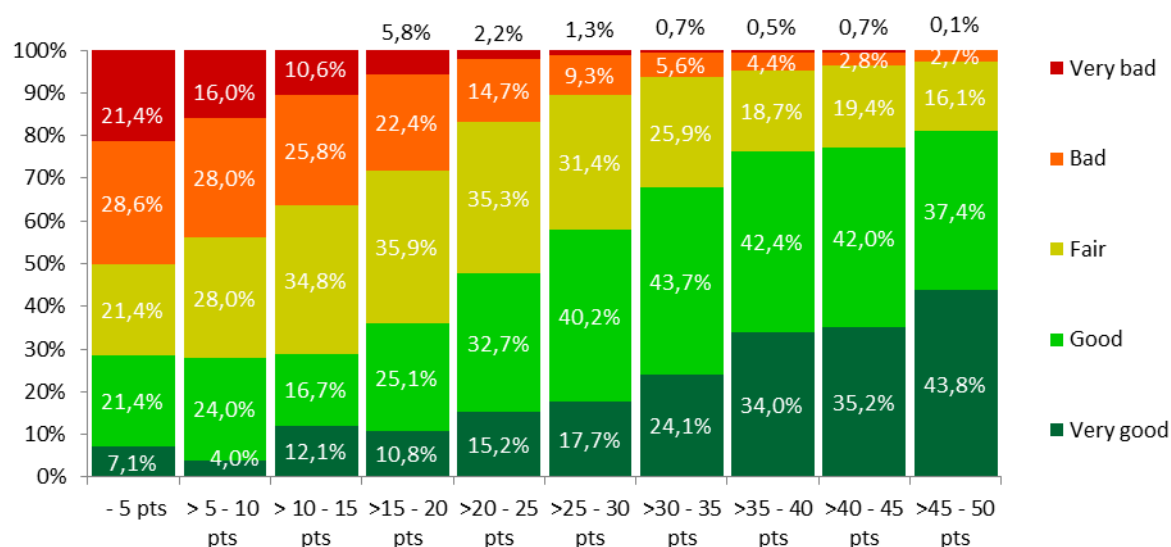
Table 23: Spearman's Rho Correlations between General Health Literacy and Health Status Variables for Countries and Total

| General Health Literacy and... | | AT | BG | DE (NRW) | EL | ES | IE | NL | PL | TOTAL |
|--------------------------------|---|---------|---------|----------|---------|---------|---------|---------|---------|---------|
| Self-Assessed Health | r | -.309** | -.278** | -.232** | -.314** | -.282** | -.237** | -.154** | -.332** | -.274** |
| | N | 1002 | 1002 | 1159 | 1043 | 1009 | 972 | 990 | 1041 | 8218 |
| Long-Term Illness | r | .227** | .257** | .136** | .256** | .127** | .091** | 0.047 | .209** | .156** |
| | N | 994 | 1002 | 1159 | 1043 | 1004 | 969 | 989 | 1037 | 8197 |
| Limitations | r | .278** | .197** | 0.08 | .324** | .212** | .123* | 0.093 | .151** | .170** |
| | N | 360 | 351 | 452 | 289 | 323 | 291 | 413 | 453 | 2932 |

**, Correlation is significant at the 0.01 level (2-tailed). *, Correlation is significant at the 0.05 level (2-tailed).

General-HL and self-assessed health are significantly correlated in all national samples (see Table 23), but with quite different Spearman values: the correlation for Poland is the highest ($r = -.33$), the Netherlands show the lowest correlation ($r = -.15$). The association between general-HL and long-term illness is significant for all countries except for the Netherlands. Correlations values vary across countries, with the lowest significant Spearman coefficient in Ireland ($r = .09$) and highest in Bulgaria ($r = .26$). General health and limitations by health problems show significant correlation for all countries except for Germany (NRW) ($r = .08$) and the Netherlands ($r = .09$).

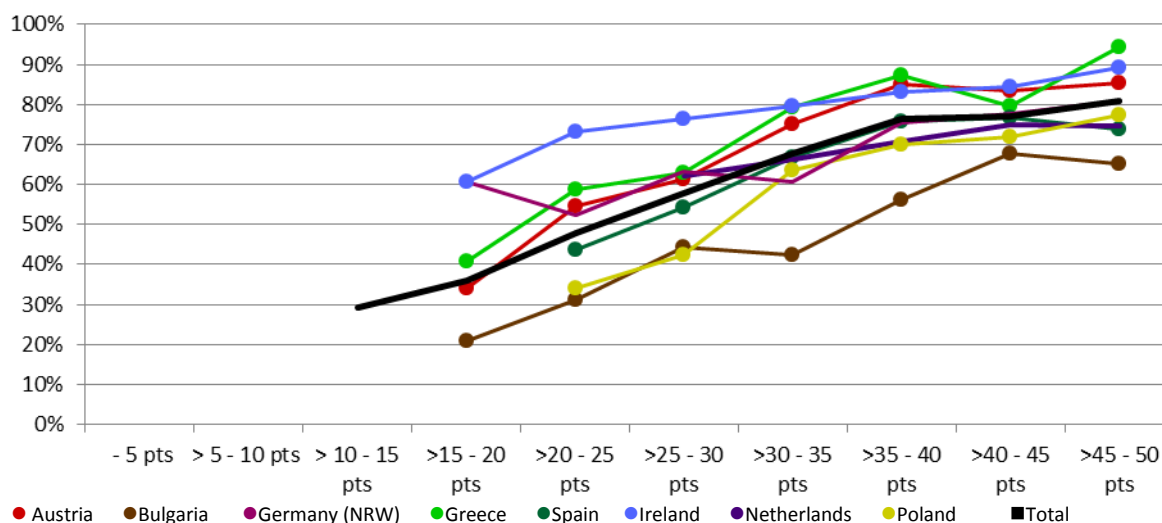
Graph 47: Self-assessed Health by General Health Literacy (Index in 5 point intervals) for Total Sample



-5[N=14] | >5[N=25] | >10[N=66] | >15[N=259] | >20[N=600] | >25[N=1348] | >30[N=2185] | >35[N=1531] | >40[N=1048] | >45[N=704] |
TOTAL[N=7780]

For the total sample there is a considerable and rather steady increase of very good health with better health literacy from 7% in the lowest group to 44% in the highest one, or for very good and good health combined from nearly 30% to more than 80% (see Graph 47). The general trend, that individuals with higher scores on the health literacy index tend to perceive their health as better, is also reflected in the rather strong bivariate correlation between the two variables ($r = -.27$) (see Table 23). This trend can also be observed for all national samples (Graph 48), where all bivariate correlations are highly significant, but vary from $r = -.15$ for the Netherlands to $r = -.33$ for Poland (Table 23).

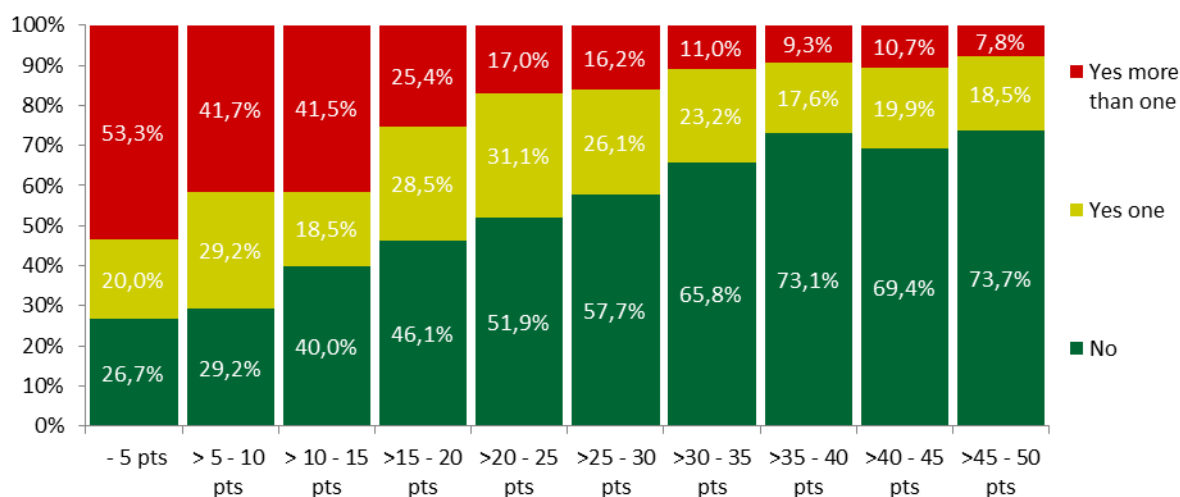
Graph 48: Self-assessed Health (percentages 'very good' and 'good') by General Health Literacy (Index in 5 point intervals) for Countries and Total



AT [N=979], BG [N=926], DE(NRW) [N=1045], ES [N=975], EL [N=999] IE [N=962], NL [N=994], PL [N=923], TOTAL [N=7794]
only levels with N > 10 are illustrated

The same general effect is true for the association between **long-term illness** and general health. In the total sample the proportion of 'no long-term illness' increases from around a quarter for the lowest level of health literacy to nearly three quarters for the highest one. The percentage of 'more than one long-term illness' decreases from more than 50% to less than 10%, with increasing health literacy (Graph 49). This kind of association can be observed for all participating countries. (Graph 50)

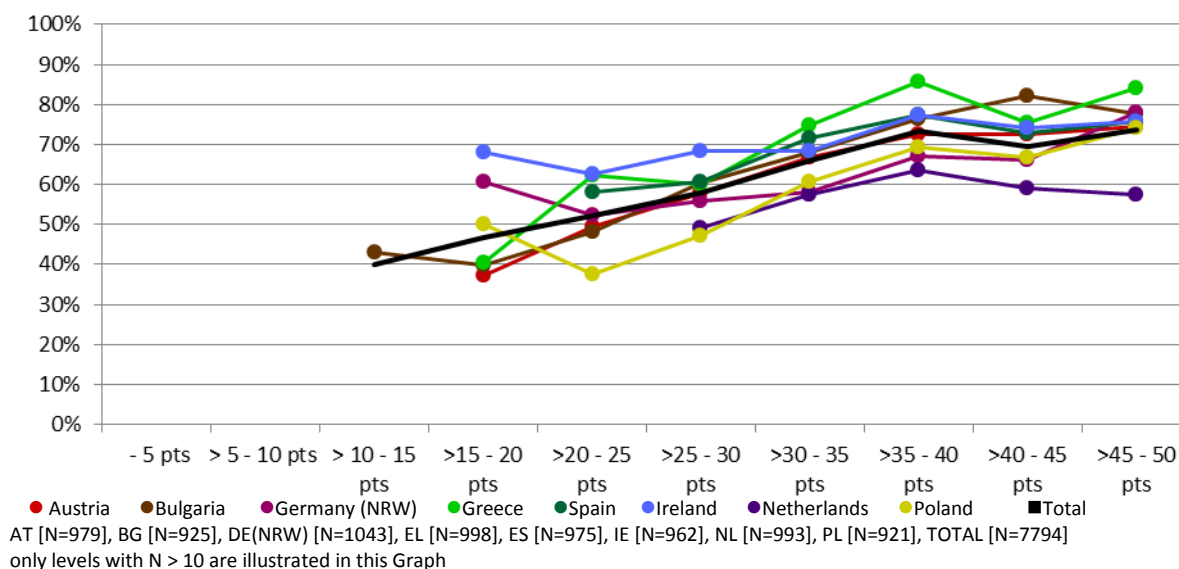
Graph 49: Long-term Illness by General Health Literacy (Index in 5 Point Intervals) for Total



-5 [N=15] | >5[N=24] | >10 [N=65] | >15[N=256] | >20[N=599] | >25 [N=1349] | >30[N=2182] | >35[N=1523] | >40[N=1042] | >45[N=703] |
TOTAL[N=7758]

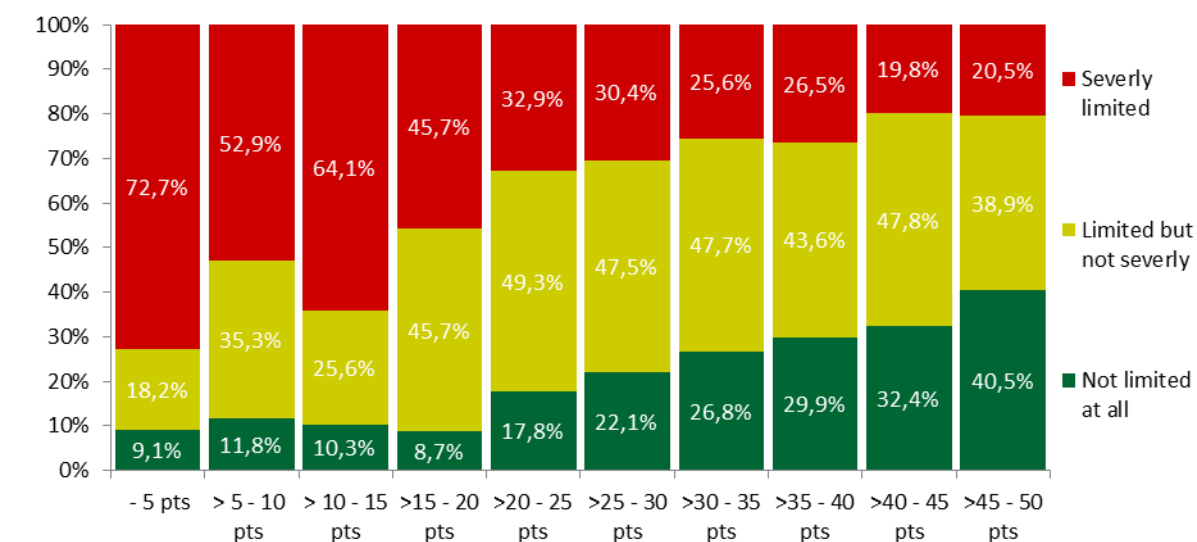
In terms of bivariate correlations, there is a considerable, highly significant correlation for the total sample of $r = .16$, which ranges on national levels from a non-significant low correlation of $r = .05$ for the Netherlands to a considerable and highly significant one of $r = .26$ for Greece (see Table 23).

Graph 50: Long-term Illness (percentages 'no long term-illness') by General Health Literacy (Index in 5 Point Intervals) for Countries and Total



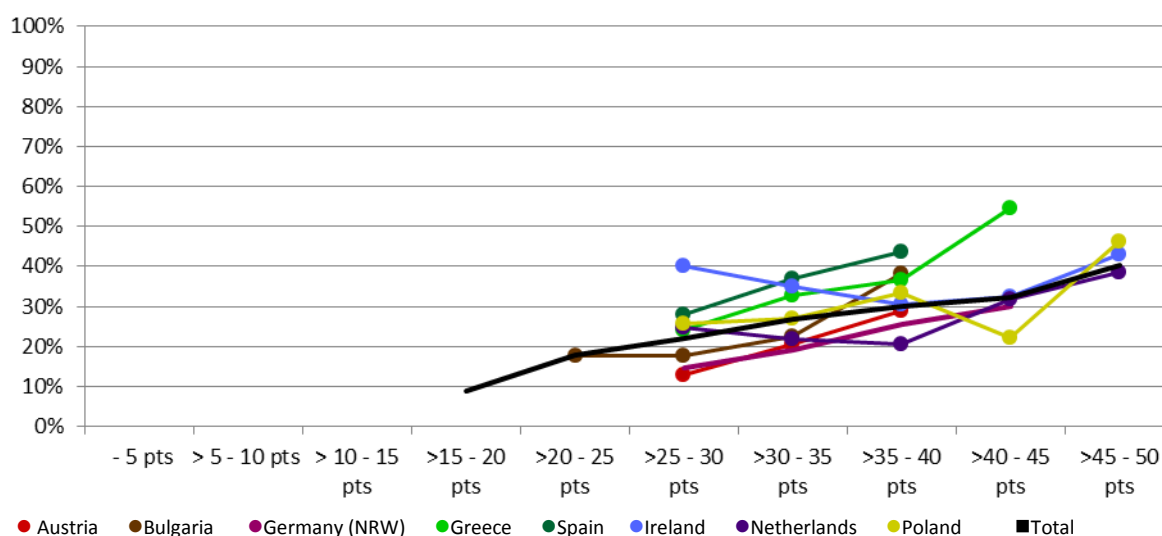
For the group of respondents with long-term illnesses there is a considerable relationship between general-HL and **limitations by health problems**. (Graph 51) The higher the level of health literacy, the higher is the percentage of the 'not limited at all' group with a share of less than 10% for the lowest level, but 40% for the highest. Looking at the proportions for the 'severely limited' group, the effect is even more dramatic, 73% for the lowest group against just 21% for the highest. (Graph 51)

Graph 51: Limited due to Health Conditions by General Health Literacy Index (Categorized in 5 pts. Steps) for Total



This trend is differently replicated in participating countries (Graph 52), as bivariate correlations show, there are considerable differences in the extent of the associations, ranging from a not significant and low effect in Germany ($r = .08$) and the Netherlands ($r = .09$) to relatively high and highly significant effects in Greece ($r = .32$) and Austria ($r = .28$) (Table 23). Respondents with better HL tend to indicate less limitation due to health problems.

Graph 52: Percentages of Not Limited by Health Problems by General Health Literacy Index (Categorized in 5 pts. Steps) for Countries and Total



AT [N=368] | BG [N=397] | DE (NRW) [N=358] | EL[N=389] | ES[N=277] | IE[N=310] | NL[N=288] | PL[N=428] | TOTAL[N=2815]

*only people with long-term illness were surveyed on this question

only levels with N > 10 are illustrated in this graph

9.5 Is Health Literacy Directly Associated With Self-Assessed Health? Results Of a Multivariate Model

Is Health Literacy Directly Associated With Self-Assessed Health? Results Of a Multivariate Model

In a bivariate perspective considerable and significant associations between health literacy and indicators for self-assessed health status have been demonstrated. But correlations can be spurious, since health literacy and self-assessed health have many determinants in common (see Table 15 - Table 17). To further prove unique and direct effects of health literacy on health status, a multivariate model was computed.

Of 11 possible predictors for self-perceived health which initially where entered into the regression model using a stepwise entering procedure⁴⁸, the following 8 indicators proved to be of predictive value: long-term illness, age, general health literacy, social status, exercising, body-mass index, gender and financial deprivation, while education, NVS scoring and alcohol consumption did not have significant effects.

The model accounts for 43% of the total variation of self-assessed health in the total sample. Amount of explained variance differs strongly by country, from 30 % for the Netherlands to 62.6% for Greece. (Table 24)

Table 24: Effects of Multiple Predictors (Beta Weights and Adjusted R-square) on Self-assessed Health, for Countries and Total

| Self- assessed health by... | Austria | Bulgaria | Germany | Greece | Spain | Ireland | Nether-lands | Poland | Total |
|-----------------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|-------|
| Long-term illness | .420 | .391 | .426 | .508 | .337 | .528 | .431 | .390 | .438 |
| Age | .226 | .277 | .137 | .302 | .211 | .118 | -.010 ^a | .256 | .182 |
| General Health Literacy | -.135 | -.082 | -.086 | -.078 | -.173 | -.122 | -.117 | -.105 | -.130 |
| Social Status | -.015 ^a | -.040 ^a | -.038 ^a | -.077 | -.009 ^a | -.051 ^a | -.135 | -.093 | -.108 |
| Exercising time | .086 | .085 | .126 | .039 ^a | .089 | .100 | .024 ^a | .132 | .083 |
| Body-Mass Index | .114 | .010 ^a | .087 | -.028 ^a | .124 | .078 | .161 | .046 ^a | .069 |
| Gender | .067 | .024 ^a | .025 ^a | .012 ^a | .075 | .030 ^a | .028 ^a | -.046 ^a | .030 |
| Financial deprivation | .086 | .049 ^a | .127 | .052 | .049 ^a | .037 ^a | .048 ^a | .132 | .028 |
| Adj. Rsquare | .481 | .462 | .379 | .626 | .357 | .426 | .300 | .543 | .436 |

AT [N=791] BG [N=831] DE(NRW) [N=902] EL [N=960] ES [N=883] IE [N=825] NL [N=935] PL [N=814] TOTAL [N=6941]

a...not significant on the 0,05 level

Long-term illness 0=no 1=yes

Self-assessed Health from very good to very bad

Exercising from almost every day to never

Gender: 0=male to 1=female

Financial deprivation: from no deprivation to high deprivation

⁴⁸ The stepwise entering algorithm automatically selects significant (based on F-statistic) variables for a model and deletes variables from the model which become insignificant in the process of variable entering.

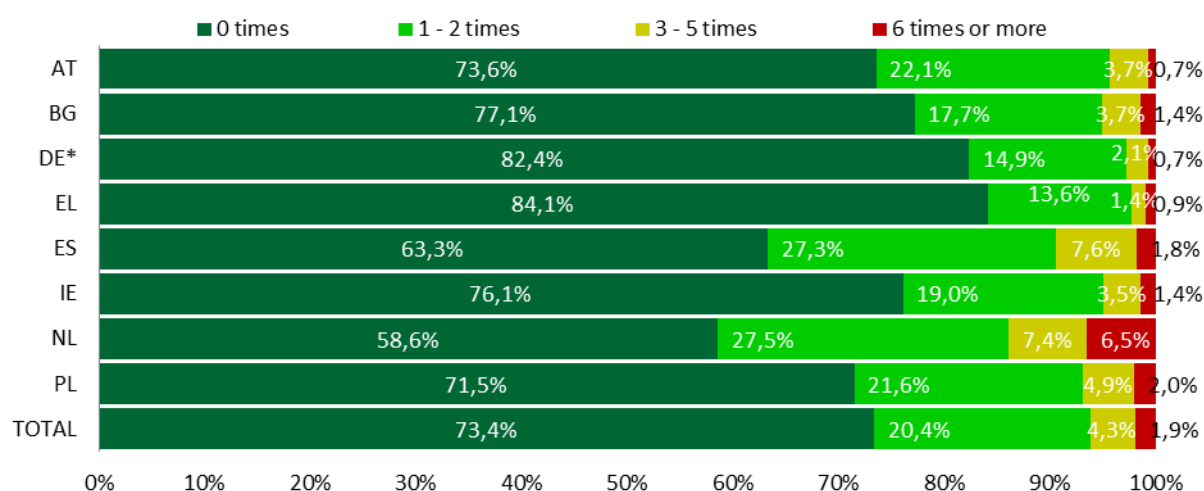
Health literacy is the third strongest significant predictor ($\beta = -.13$) for health status, only long-term illness ($\beta = .44$) and age ($\beta = .18$) are more important in the total sample. The association strength between HL and self-assessed health varies considerably between countries. While in Greece ($\beta = -.08$), Bulgaria ($\beta = -.08$) and Germany ($\beta = -.09$) health literacy is less important, it has relatively higher beta values for Spain ($\beta = -.17$), Austria ($\beta = -.14$), Ireland ($\beta = -.12$) and the Netherlands ($\beta = -.12$). Health literacy has stronger associations with self-assessed health than social status ($\beta = -.11$) or exercising ($\beta = .08$), in the total sample. Associations for BMI ($\beta = .07$), gender ($\beta = .03$) and financial deprivation ($\beta = .03$) are even smaller. These results show a significant and remarkable direct association between health literacy and self-assessed health in the total sample and on the national level, even when adjusted for relevant health status, behavioural, and socio-economic covariates.

9.6 Health Service Use: Emergency Services, Hospitals, Doctors and Other Health Professionals – Percentages and Associations

Four kinds of health service use have been measured: frequency of contacts to emergency services in the last 2 years respectively of hospital admissions, of doctor visits and of use of services from other health professionals in the last 12 months.

In the total sample 20.4% of respondents have contacted **Emergency services** 1-2 times in the last 2 years. 6.2% three or more times and a majority of 73.4% had no contacts at all. This proportion of non-users varies considerably, between 58.6% for the Netherlands and 84.1% for Spain. The percentage for frequent users (more than 3 times) is highest in the Netherlands (13.9%) and lowest in Greece (2.3%). (Graph 53) These variations probably reflect underlying differences in health care systems.

Graph 53: Percentages for Frequency Emergency Service Contact⁴⁹ for Countries and Total



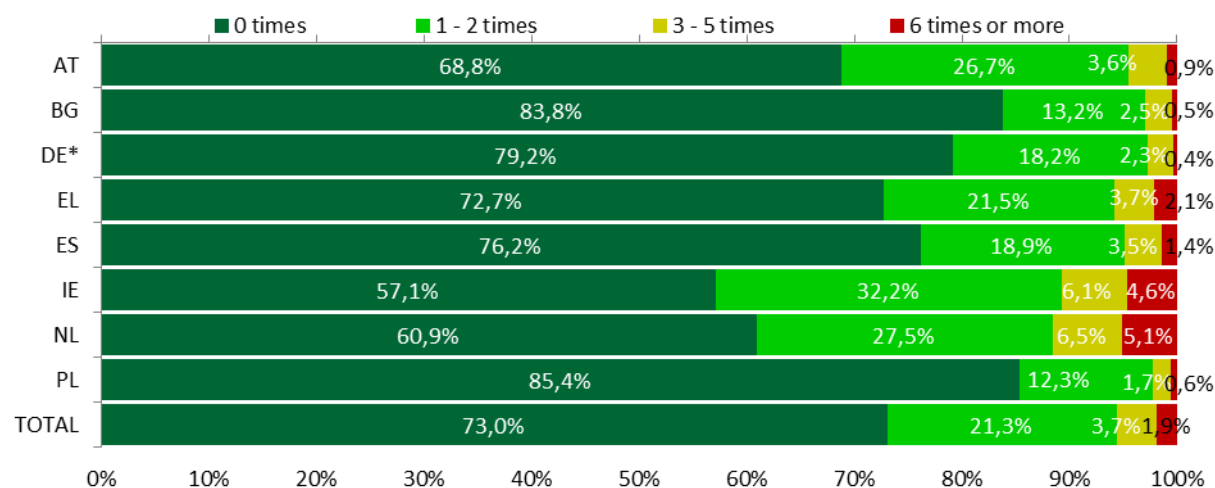
AT [N=1006] | BG [N=992] | DE (NRW) [N=1057] | EL [N=1000] | ES [N=1001] | IE [N=1004] | NL [N=1020] | PL [N=993] | TOTAL [N=8073]

*only NRW

⁴⁹ How many times have you had to contact the emergency service in the last 2 years?
(Instruction: Ambulance, out of hours clinic, emergency department) (1) 0 (2) 1 - 2 times (3) 3 - 5 times (4) 6 times or more (5) DK/ Refusal (SPONTANEOUS)

For **hospital service** use in the last 12 month a majority of nearly 3/4 (73.0%) reported no use. 21.3% of the respondents in the total sample used hospital services 1 to 2 times, 3.7% 3 to 5 times and 1.9% 6 or more times.

Graph 54: Percentages for Hospital Service Use⁵⁰ for Countries and Total



AT [N=1003] | BG [N=985] | DE (NRW) [N=1057] | EL[N=1000] | ES[N=1001] | IE[N=1002] | NL[N=1019] | PL[N=1000] | TOTAL[N=8066]

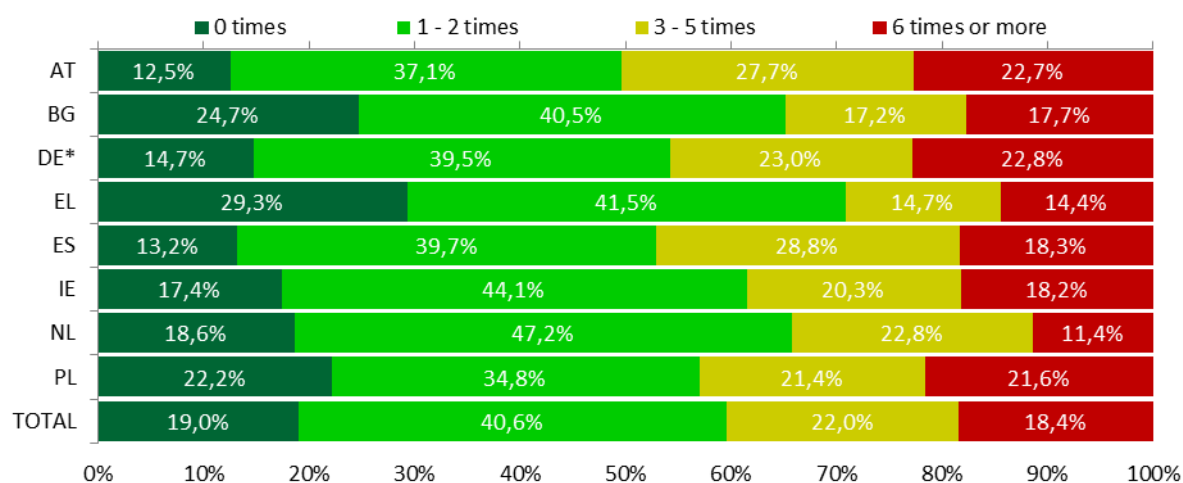
*only NRW

Again, there is considerable variation of non-hospital use between countries, from 57.1% in Ireland to 85.4% in Poland, while the percentage of most frequent users (3 or more times) varies from 2.3% in Poland to 11.6% in the Netherlands (see Graph 54). Probably, these variations in hospital use also reflect differences in health care systems of the participating countries.

⁵⁰ How many times have you used a hospital service in the last 12 months? (1) 0 (2) 1 - 2 times (3) 3 - 5 times (4) 6 times or more (5) DK/Refusal (SPONTANEOUS)

In contrast to emergency services or hospital use only a minority of 19.0% report no doctor visits in the last 12 months. More than 40% report 1 or 2, 22.0% 3 to 5 and 18.4% 6 or more visits, in the total sample.

Graph 55: Percentages for Frequency of Doctor Visits⁵¹ for Countries and Total



AT [N=1011] | BG [N=997] | DE (NRW) [N=1056] | EL[N=999] | ES[N=997] | IE[N=1005] | NL[N=1020] | PL[N=995] | TOTAL[N=8080]

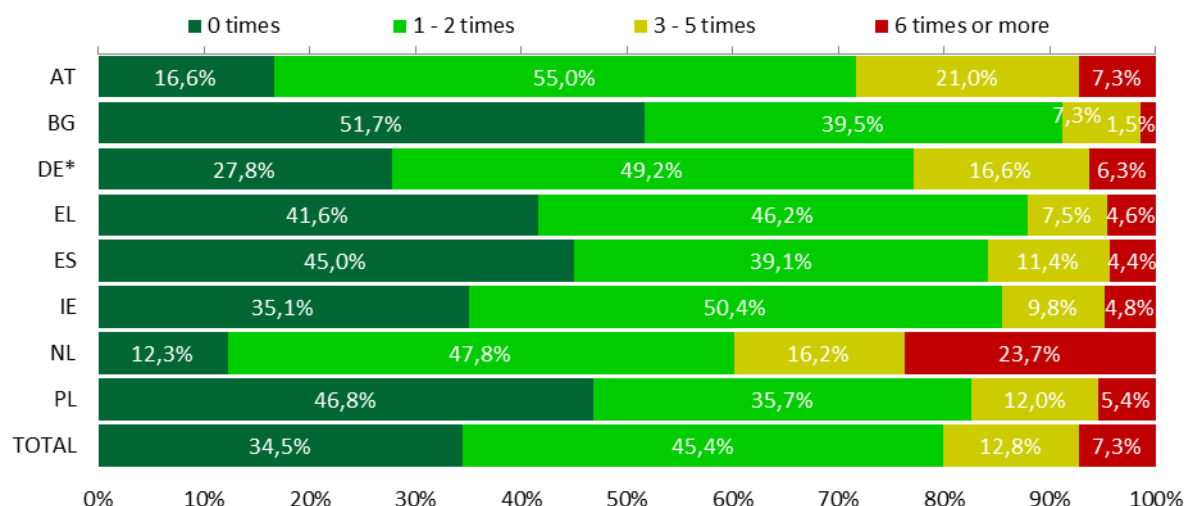
*only NRW

Proportion of no doctor visits ranges from 12.5% in Austria to 29.3% in Greece, higher frequencies of visits (three or more) from 29.1% in Greece to 50.4% in Austria (see Graph 55).

⁵¹ How many times have you been to the doctor in the last 12 months? (1) 0 (2) 1 - 2 times (3) 3 - 5 times (4) 6 times or more (5) DK/Refusal (SPONTANEOUS)

For the heterogeneous indicator, use of **‘other health professionals’ services** (such as dentist, physiotherapist, psychologist, dietician, or optician) in the last 12 month, even more variation of percentages between countries is found (see Graph 56).

Graph 56: Percentages for Frequency of Other Health Professionals⁵² Service Use for Countries and Total



AT [N=1010] | BG [N=995] | DE (NRW) [N=1056] | EL[N=999] | ES[N=999] | IE[N=1004] | NL[N=1023] | PL[N=997] | TOTAL[N=8083]

*only NRW

Percentages for non-use vary strongly from 12.3% for the Netherlands or Austria with 16.7% to 51.7% for Bulgaria or 46.8% for Poland. In contrast, the shares for highest use (3 times or more) are largest in the Netherlands (39.9%) and lowest in Bulgaria (8.8%). Once more differences in health care systems have to be taken into account, to understand these considerable national variations of service use.

⁵² How many times have you used services from other health professionals, such as dentist, physiotherapist, psychologist, dietician, or optician in the last 12 months? (1) 0 (2) 1 - 2 times (3) 3 - 5 times (4) 6 times or more (5) DK/ Refusal (SPONTANEOUS)

All **intercorrelations** of the four indicators for health service use are significant, positive and of considerable size (see Table 25). Emergency service contacts are correlated highest with hospital service use ($r = .37$), also significantly, but lower with doctor visits ($r = .27$) and other health professionals ($r = .14$). Doctor visits are correlated highest with hospitals service use ($r = .36$), use of other health professionals ($r = .27$) and emergency contact ($r = .27$). Thus use of these different kinds of services on average is not just complementary or substitutive, but is correlated, since there are respondents whose health status affords extensive and combined use of more than one service and others, who have no demand for health service use at all.

Table 25: Spearman's Rho Correlations Between Health Service Use Variables for Total

| | | Emergency Services | Doctor Visits | Hospital Service | Other Health Professionals |
|----------------------------|---|--------------------|---------------|------------------|----------------------------|
| Emergency Services | r | 1 | | | |
| | N | 8532 | | | |
| Doctor Visits | r | .272** | 1 | | |
| | N | 8513 | 8544 | | |
| Hospital Service | r | .366** | .363** | 1 | |
| | N | 8509 | 8510 | 8529 | |
| Other Health Professionals | r | .142** | .266** | .190** | 1 |
| | N | 8518 | 8529 | 8520 | 8548 |

** . Correlation is significant at the 0.01 level (2-tailed).

9.7 How Is Health Literacy Associated with Health Service Use? Emergency Services, Hospitals, Doctors and Other Health Professionals

Health literacy has been widely discussed with regard to health service use and health costs. Gordon et al.⁵³ reported increased numbers of hospital visits for illiterate rheumatoid patients compared to literate ones. Baker stated for Medicare managed elderly care enrollees in the United States that inadequate functional health literacy was an independent risk factor for hospital admission.⁵⁴ In an earlier study Baker et al.⁵⁵ described the same effect for a patient population in Atlanta (US), where individuals with inadequate health literacy had an increased risk of hospital admission. The same study found no relations between health literacy and physician visits. Howard et al.⁵⁶ found in their study on elderly Medicare patients increased emergency costs for patients with inadequate health literacy (between 62\$ and 154\$). While other costing effects like a total cost difference or inpatient cost difference were not significant.

Thus available studies regarding health service use draw their data mainly from American patient populations. Therefore the above stated effects may not be generalizable for whole populations or for European countries.

Hence the interesting question to be answered by data from the HLS-EU study is: Can a direct effect of health literacy on health service use be demonstrated, when other effects, like health status or social background, are controlled for? To answer this, firstly bivariate associations of health literacy with indicators of health service use will be presented, before the strongest effects will be further researched by use of a multivariate model.

⁵³ Gordon MM, Hampson R, Capell HA, Madhok R. 2002. Illiteracy in rheumatoid arthritis patients as determined by the Rapid Estimate of Adult Literacy (REALM) score. *Rheumatology*. 41(7): 750-754.

⁵⁴ Baker DW, Gazmararian JA, Williams MV, Scott T, Parker RM, Green D, Ren J, Peel J. 2002. Functional health literacy and the risk of hospital admission among Medicare managed care enrollees. *American Journal of Public Health*. 92(8): 1278-1283.

⁵⁵ Baker DW, Parker RM, Williams MV, Clark WS. 1997. The relationship of patient reading ability to self-reported health and use of health services. *American Journal of Public Health*. 87(6): 1027-1030.

⁵⁶ Howard DH, Gazmararian J, Parker RM. The impact of low health literacy on the medical costs of Medicare managed care enrollees. *Am J Med* 2005;118(4):371-7.

In summary, the relationships between general health literacy and health service use, measured by Spearman correlations, are significant but rather low (between $r = -.06$ and $r = -.11$) for the total sample.

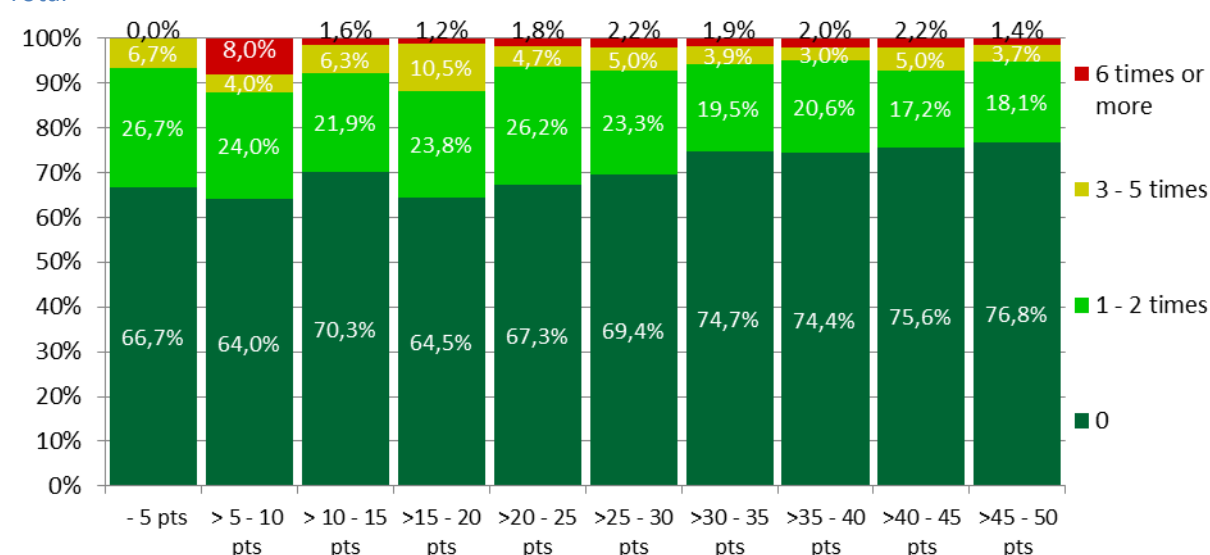
Table 26: Correlations between General Health Literacy and Indicators for Health Service Use for Countries and Total

| General Health Literacy and... | | AT | BG | DE (NRW) | EL | ES | IE | NL | PL | TOTAL |
|--|---|---------|---------|----------|---------|---------|--------|--------|---------|---------|
| Emergency Service (last 24 month) | r | -.151** | -.100** | -.112** | -.086** | -.103** | -0.046 | -0.011 | -.076* | -.061** |
| | N | 999 | 995 | 1161 | 1043 | 1009 | 970 | 990 | 1035 | 8202 |
| Doctor Visits (last 12 month) | r | -.185** | -.117** | -.073* | -.168** | -.155** | -.077* | -0.014 | -.095** | -.114** |
| | N | 1003 | 1002 | 1160 | 1042 | 1007 | 971 | 990 | 1041 | 8216 |
| Hospital Services (last 12 month) | r | -.188** | -.121** | -.112** | -.120** | -.065* | -0.048 | -0.031 | -.147** | -.062** |
| | N | 998 | 988 | 1160 | 1043 | 1008 | 969 | 990 | 1043 | 8199 |
| Other Health Professionals (last 12 month) | r | -0.06 | 0.061 | -0.016 | .114** | -0.015 | 0.033 | 0 | .070* | .062** |
| | N | 1003 | 999 | 1161 | 1042 | 1008 | 971 | 992 | 1041 | 8217 |

** . Correlation is significant at the 0.01 level (2-tailed).

The effects of health literacy on the frequency of **emergency service use** is significant but with a correlation coefficient of about $r = .06$ small in the total sample, there are remarkable variations by country, from small and not significant correlations for the Netherlands ($r = -.01$) or Ireland ($r = -.05$) up to highly significant and more substantial ones for Germany ($r = -.11$) or Austria ($r = -.15$) (Table 26). The low correlation for the total sample also is illustrated by Graph 57, which indicates that there is only a slightly higher percentage of non-use (around 10%) with increasing health literacy. Furthermore, the relationship for high use (3 times and more) is rather inconsistent.

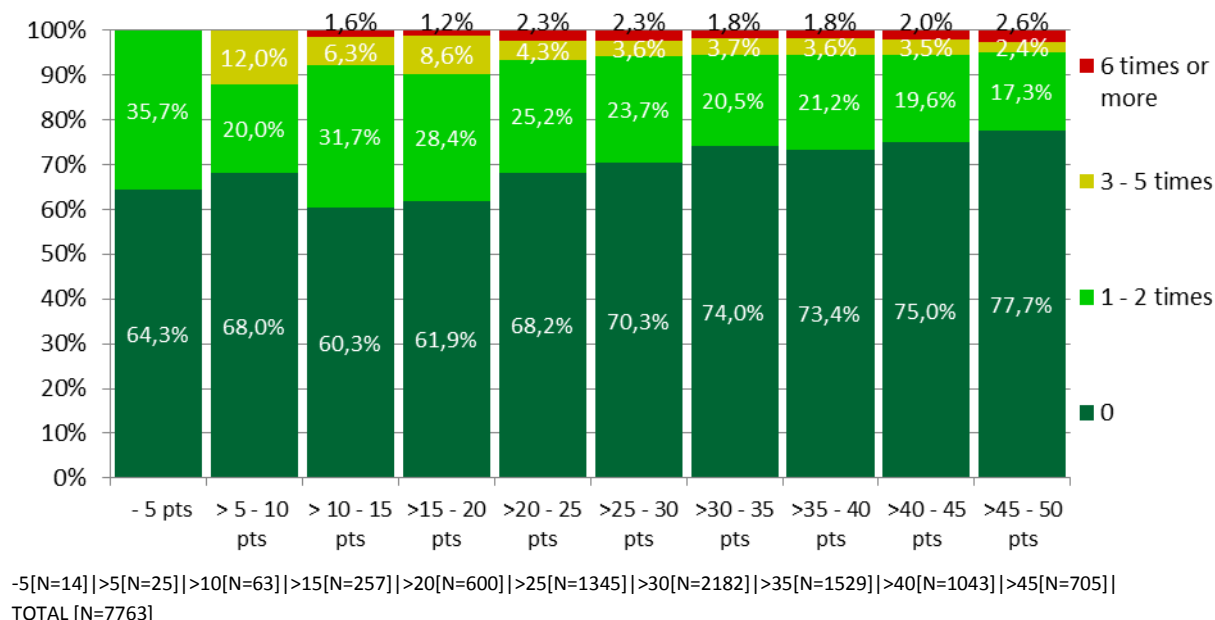
Graph 57: Emergency Service Use by General Health Literacy Index (categorized in 5 pts. steps) for Total



-5[N=15] | >5[N=25] | >10[N=64] | >15[N=256] | >20[N=599] | >25[N=1347] | >30[N=2180] | >35[N=1533] | >40[N=1047] | >45[N=702] | TOTAL [N=7768]

As mentioned above, previous studies indicated an increased risk of **hospitalization** for patients with low health literacy levels. These results are modestly confirmed by the HLS-EU study.

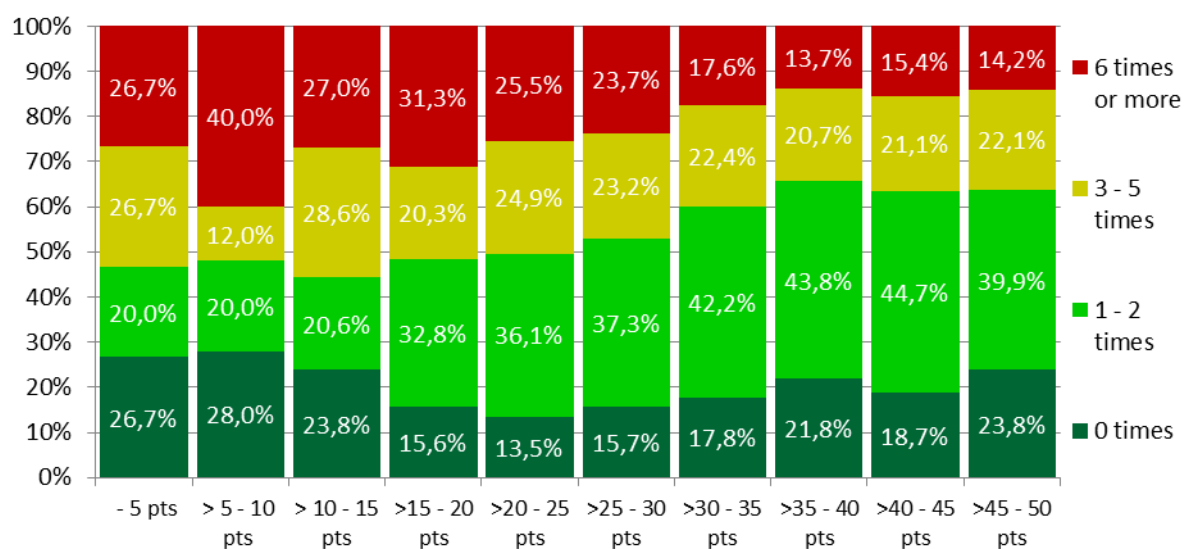
Graph 58: Frequency of Hospitalizations by General Health Literacy Index (Categorized in 5 pts. Steps) for Total



Health literacy has a significant though small effect ($r = -.06$) on the frequency of hospital stays in the last twelve month for the total sample. There are countries where this effect is highly significant and stronger, like for Austria ($r = -.19$) and others, like the Netherlands ($r = -.03$) and Ireland ($r = -.05$), where it is weak and non-significant (Table 26).

Bivariate effects of general health literacy on frequency of **doctor visits** are significant for HLS-EU data. Individuals with higher scores on the general-HL index tend to visit doctors less frequently, at least as far as heavy users (three and more times) are concerned. For lower health literacy levels, about every second respondent is in this category, for higher levels only around every third. A closer analysis of this general effect reveals a more complicated relationship between the two variables.

Graph 59: Doctor Visits by General Health Literacy Index (Categorized in 5 pts. Steps) for Total

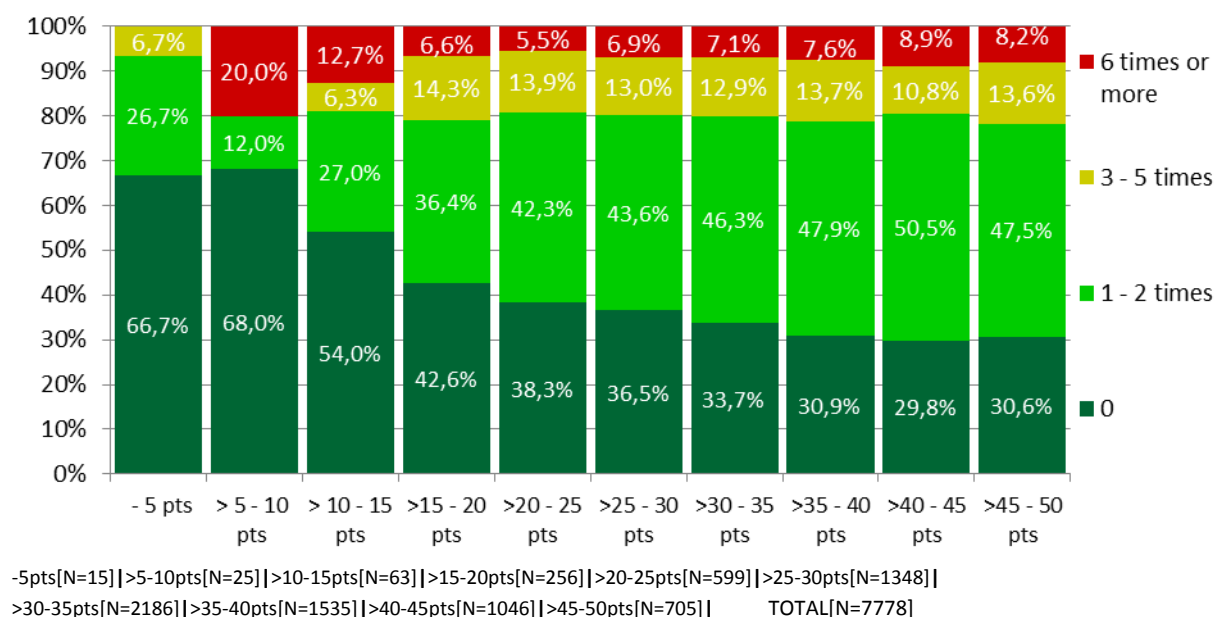


-5[N=15] | >5 [N=25] | >10 [N=63] | >15 [N=256] | >20 [N=599] | >25 [N=1348] | >30 [N=2186] | >35 [N=1535] | >40 [N=1046] | >45 [N=705] | TOTAL [N=7778]

For higher health literacy levels there is not only a trend of decreased percentages for heavy users (3 times and more) or very heavy users (6 times or more), but also an increase for light users (between 1-2 times), while the relationship for non-users is inconsistent (see Graph 59). Judged by bivariate correlations in the total sample, the relationship between general health literacy and frequency of doctor visits, with a correlation coefficient of $r = -.11$, is almost twice as strong as the association of health literacy with the other three indicators of health service use. The coefficient varies remarkably by country, from a very small non-significant one for the Netherlands ($r = -.01$) to highly significant stronger ones for Austria ($r = -.19$), Greece ($r = -.17$) or Spain ($r = -.16$) (Table 26).

The effects of general health literacy on frequencies of **other health professional visits** are half as strong, but reversed, with a coefficient of $r = .06$, for the total sample. This association is only significant in two countries, in Greece ($r = .11$) and in Poland ($r = .07$) (Table 26). The strongest effects can be observed for proportions of no use, which are somewhat more than twice as high for low literacy levels compared to high ones (Graph 60). The difference in the indicated effect size shown by correlation coefficients (Table 26) or percentage distributions (Graph 60) is due to the very small N's for low health literacy levels.

Graph 60: Frequency of Visits to Other Health Professionals by General Health Literacy Index (Categorized in 5 pts. Steps) for Total



9.8 Does Health Literacy Directly Affect the Frequency of Doctor Visits?

Results of a Multivariate Model

The strongest significant bivariate association between health literacy and an indicator for health service use was found for the frequency of doctor visits in the HLS-EU study. Baker et al.⁵⁷ already demonstrated in their study that this effect vanishes, when adjusted for age, health status and economic indicators. Therefore, the bivariate association between health literacy and frequency of doctor visits is further investigated by a multivariate model, controlling for other important covariates.

Of 9 predictor variables which were entered stepwise⁵⁸ into the regression model for the total sample, the following 6 proved to be of predictive value for the frequency of doctor visits: long term illness, self-perceived health, gender, age, financial deprivation and Body-Mass-Index. General-health literacy, self-assessed social status and frequency of physical exercising had no significant effects.

Overall, the model accounts for more than 30% of the total variation of frequency of doctor visits in the total sample. It is more predictive for Greece (36.6%) than for all other countries, and least for Spain (20.9%) and the Netherlands (21%) (see Table 27).

Table 27: Frequency of doctor visits (in the Last 12 month) by Multiple Predictors (Beta Weights and Adjusted R-square) for Countries and Total

| Frequency of doctor visits (last 12 month)... | Austria | Bulgaria | Germany | Greece | Spain | Ireland | Netherlands | Poland | Total |
|---|-------------------|-------------------|-------------------|--------|--------------------|-------------------|--------------------|-------------------|-------|
| Long-term illness | .321 | .501 | .367 | .25 | .239 | .277 | .251 | .354 | .324 |
| Self-assessed health | .282 | .126 | .248 | .3 | .214 | .295 | .238 | .245 | .235 |
| Gender | .077 | .137 | .118 | .061 | .087 | .159 | .089 | .148 | .111 |
| Age | .104 | .04 ^a | .051 | .179 | .103 | .062 | -.011 ^a | .064 ^a | .069 |
| Financial deprivation | .054 ^a | -.09 | .012 ^a | -.073 | .029 ^a | .031 ^a | -.008 ^a | -.079 | -.046 |
| Body-Mass-Index | .028 ^a | .002 ^a | .034 ^a | -.06 | -.035 ^a | .024 ^a | .095 | .053 | .025 |
| Adj. Rsquare | .39 | .38 | .343 | .366 | .209 | .311 | .21 | .353 | .304 |

AT [N=861] BG [N=889] DE(NRW) [N=942] EL [N=980] ES [N=913] IE [N=900] NL [N=983] PL [N=894] TOTAL [N=7362]

a...not significant on the .05 level

long-term illness 0=no 1=yes

Self-assessed Health from very good to very bad

Exercising from almost every day to never

Gender from 0=male to 1=female

Financial deprivation from no deprivation to high deprivation

⁵⁷ Baker DW, Parker RM, Williams MV, Clark WS. 1997. The relationship of patient reading ability to self-reported health and use of health services. American Journal of Public Health. 87(6): 1027-1030.

⁵⁸ The stepwise entering algorithm automatically selects significant (based on F-statistic) Variables for a model and deletes variables from the model which become insignificant in the process of variable entering.

But, in the multivariate model health literacy has no longer any direct effect on the frequency of doctor visits. Thus the results of the Baker study are replicated for the general population of the HLS-EU sample.

Which predictor variables explain the frequency of doctor visits the best? Long term health condition is - with a standardized regression coefficient of $\beta = .32$ - the most important predictor, followed by self-assessed health status ($\beta = .24$) and gender ($\beta = .11$). All coefficients are positive for all countries and the total sample, indicating that individuals suffering from long term health conditions as well as individuals indicating bad health and females visit the doctors more frequently. With the other covariates controlled for, even age produces in some countries no longer genuine, direct and significant effects (Bulgaria, Netherlands, Poland) though it is, with positive coefficients larger than $\beta = .1$, still a significant and relevant covariate in other countries (Austria, Greece, Spain) where elderly people do to the doctor more frequently. In those countries (Greece, Poland, Bulgaria) where financial deprivation produces significant effects at all, the coefficients are small and negative ($\beta = -.07$ to $\beta = -.09$), indicating that financially deprived individuals tend to visit doctors less often.