

ORIGINAL ARTICLE

Relationship between literacy skills and self-reported health in the Nordic countries

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Abstract

Aims: This study investigated the association between literacy skills and self-reported health among Danish ($n = 7284$), Finnish ($n = 5454$), Norwegian ($n = 4942$) and Swedish ($n = 4555$) participants aged 16–65 years. **Methods:** Logistic regression models were used to assess the association between literacy skills and self-reported health after adjusting for sex, age and educational level. **Results:** Nordic participants aged 16–65 years with literacy skills at the lowest level reported sub-optimal health more often (28–37%) than those with literacy skills at the highest level (7–9%). After adjusting for sex, age and educational level, the likelihood of reporting sub-optimal health was 1.99–3.24 times as high for those with literacy skills at the lowest level as for those with literacy skills at the highest level. **Conclusions:** **These results suggest that poor literacy skills increase the likelihood of experiencing poor health in the Nordic countries, even after controlling for educational level.**

Key Words: *Literacy skills, health literacy, sex, age, educational level, self-reported health, Nordic countries, PIAAC*

Introduction

The past few years have seen an increase in the number of publications on health literacy and this is now recognized as an issue of relevance to public health [1,2]. Although most evidence on health literacy comes from the USA and mainly focuses on functional health literacy – that is, the ability to read and understand basic health-related information [1], Sørensen et al. [2], based on a systematic literature review, suggested the following new ‘all-inclusive’ comprehensive definition:

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 course.

Access to, and an understanding of, health information is a central aspect of health literacy in both this

comprehensive definition of health literacy and the more traditional understanding of functional health literacy; both views link health literacy to literacy [1,2]. It should, however, be considered that health information does not only consist of written information, but also information in spoken or digital form [3]. Literacy skills, defined in the OECD Survey of Adult Skills [4] as ‘the ability to understand, evaluate, use and engage with *written texts* to participate in society, to achieve one’s goals, and to develop one’s knowledge and potential’, are crucial in understanding and interpreting written health information either on the internet or in print.

The extent to which adults access, understand and comply with written health information may be important not only for how they maintain their own health and that of their families, but also for the prevention of disease and for health promotion generally [1]. Advice relating to nutrition, physical activity and

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the prevention of disease is often given in newspapers, in magazines and via websites. Such advice represents an important basis for individual decisions about how to act and whether to contact a health professional about health concerns. In addition, written information may also be important as a complement to oral information given by medical practitioners during consultations.

International longitudinal studies have confirmed that adequate skills in the fields of literacy and numeracy yield positive outcomes in important aspects of life, such as employment, social situation and health [5–7]. High literacy rates in the population benefit societies as the individuals are more informed and enjoy better health [1]. Poor literacy skills are associated with less participation in health promoting and disease detection activities, higher smoking rates, more work accidents, diminished management of chronic disease, poor adherence to medication, increased hospitalization and increased morbidity [1]. Although educational level is a strong predictor of health in most European countries [8], literacy skills are an even stronger predictor of health in studies examining the association between socio-economic status and health [1,9].

A systematic review of 96 studies comparing health outcomes with directly measured health literacy or numeracy concluded that poor functional health literacy is associated with a poorer use of health care services, a poorer ability to take medications correctly and a poorer ability to interpret labels and health messages [10]. Among elderly people, poor health literacy was associated with poorer overall health and higher mortality [11]. In these studies, health literacy was most commonly measured with the Rapid Estimate of Adult Literacy in Medicine or the Test of Functional Health Literacy in Adults [10,12] tools, measures closely linked to literacy skills. Inadequate health literacy has also been found to be associated with poor self-reported health (SRH) [13] and to predict all-cause mortality and cardiovascular deaths in community-dwelling elderly persons [9].

In the Program for International Assessment of Adult Competencies (PIAAC), the oldest age group (55–65 years) had the poorest literacy skills across all the Nordic countries [4]. The age group >66 years was not included in PIAAC. This age group was, however, included in the Canadian sample in PIAAC's predecessor, the International Adult Literacy Survey, and scored significantly lower on literacy than all other age groups [14]. Older populations have a high prevalence of chronic disease and therefore a need to understand health-related information. Hence poor literacy skills can be of tremendous importance in this age group [15].

People with undeveloped reading skills will have less exposure to traditional health education and also less developed skills to act on the information received [1,16]. Previous research has shown a consistent association between low reading skills and more limited health-related knowledge and comprehension [10]. Hence an adequate level of health literacy in the population is dependent on an adequate level of overall literacy skills. Literacy skills are strongly associated with educational level [4], but do, however, vary within educational level. Therefore, literacy might also be associated with health after adjusting for educational level.

Good health is dependent on many variables and is unevenly distributed among socio-demographic groups in most OECD countries [17]. The majority of the research in the field of literacy and health outcomes has been conducted in the USA, where access to education and good health care services is unevenly distributed [18,19]. Less is known about the association between literacy skills and health in the Nordic countries, where everyone has access to education [20] and good health care services irrespective of income [21]. From a public health perspective, knowledge about the associations between literacy skills and health among Nordic citizens when controlling for educational level can show whether literacy skills constitutes a 'health risk' beyond education. The PIAAC [12], in which Denmark, Finland, Norway and Sweden participated in 2011–2012, includes a direct measurement of skills combined with a comprehensive background questionnaire and offers unique opportunities to explore associations between adults' levels of literacy skills, socio-economic factors and SRH in the Nordic countries.

The aim of this study was to explore the association between sub-optimal SRH and literacy skills in the Nordic countries, controlling for sex, age and educational level. We used survey data from the PIAAC [4] covering a total sample of 22,389 Danish, Finnish, Norwegian and Swedish participants aged 16–65 years.

Methods

The study was based on cross-sectional data from the international survey of adult skills (PIAAC). In the first round of data collection in 2011–2012, PIAAC included representative samples of 16–65-year-old participants from 23 countries, among them the Nordic countries of Denmark, Finland, Norway and Sweden (Table I). Data were gathered face-to-face, mostly in the participants' homes. Literacy, numeracy and problem-solving

Table I. Number of respondents and prevalence of sub-optimal self-reported health (SRH) in different socio-demographic groups and across literacy levels.

Variable	Category	No. of respondents				Sub-optimal SRH (%)			
		Denmark	Finland	Norway	Sweden	Denmark	Finland	Norway	Sweden
Total		7284	5454	4942	4555	17	18	17	16
Sex	Male	3590	2753	2555	2249	16	20	16	14
	Female	3694	2701	2387	2214	18	16	18	19
Age group (years)	16–24	1064	895	963	841	9	8	10	11
	25–34	1028	1043	919	801	11	9	13	10
	35–44	1353	970	1071	866	16	11	12	14
	45–54	1446	1,120	1,056	924	21	20	20	18
	55–65	2393	1426	933	1031	26	36	30	25
Educational level	Low	1696	978	1224	930	26	26	25	26
	Medium	2394	2315	1815	1519	17	20	17	14
	High	2864	2161	1902	1510	10	11	10	10
Literacy skills	Level ≤1	1246	470	503	518	34	37	28	32
	Level 2	2558	1437	1507	1218	20	25	22	20
	Level 3	2949	2353	2304	2000	11	14	13	12
	Level 4/5	531	1194	628	727	8	8	9	7

skills in technology-rich environments were assessed directly, whereas information about demographics, education, social and linguistic background, employment and skills use was obtained through an extensive interview. More details about the assessment and sampling can be found elsewhere [22].

Self-reported health is a reliable and valid measure of general health status and can be used for international comparisons [8,23]. In PIAAC, the SRH measure was based on a subjective health question, ‘In general, would you say your health is excellent, very good, good, fair, or poor?’ The answers were grouped into two categories: optimal SRH (‘excellent’, ‘very good’ and ‘good’) and sub-optimal SRH (‘fair’ and ‘poor’). In the pilot study conducted in 2010, two more health items were included in the questionnaire, but bivariate and multivariate analyses showed that the subjective question worked best [22].

The literacy measure in PIAAC was designed to address three cognitive strategies necessary for achieving a full understanding of texts: accessing and identifying information in a text; integrating and interpreting texts; and evaluating and reflecting on texts [22]. Different text types, text formats (printed and digital) and contexts were included [22]. The scoring range was 0–500 points and the scores were divided into five proficiency levels (1–5; 1 lowest). Four dummies were applied in the analyses: level 1 or lower, level 2, level 3 and level 4/5 (reference category).

Information on sex, age and educational level was obtained from the interview. To control for the possible effect of age on sub-optimal SRH, the samples were divided into 10-year age groups: 16–24, 25–34, 35–44, 45–54 and 55–65 (reference category) years.

The measure of educational level was based on detailed International Standard Classification of Education 97 (ISCED) codes, recoded into three broad levels: low (ISCED 1, 2 and 3C short, i.e. lower secondary school or less); medium (ISCED 3C long, 3A–B and 4, i.e. upper secondary school and vocational training); and high (ISCED 5 and 6, i.e. a bachelor’s degree or higher).

Statistical analyses

The IBM SPSS version 21 complex samples module was used for the logistic regression analyses and IDB Analyzer was used for the descriptive statistics. The analyses were performed separately for each country using weights to take the sample design into account. The prevalence of sub-optimal SRH in different socio-demographic groups was described by descriptive statistics. Two logistic regression models were applied for each country to explore the association between literacy skills and sub-optimal SRH taking sex, age and educational level into account. In model 1, only the variable of literacy skills was included, whereas sex, age and educational level were added in model 2. The results were reported as odds ratios with 95% confidence intervals (95% CI) for having sub-optimal SRH.

Results

The prevalence of sub-optimal SRH was very similar in the Nordic countries (Table I), ranging between 16 (Sweden) and 18% (Finland). Sex differences were small in all four countries. Women in Denmark, Norway and Sweden were slightly more likely to have

Table II. Logistic regression of the association between literacy skills and sub-optimal self-reported health in **Denmark** before and after controlling for sex, age and educational level.

	Variable	Odds ratio (95% confidence interval)	
		Model 1	Model 2
Literacy	Level ≤1	6.28 (4.25–9.28)	2.90 (1.91–4.42)
	Level 2	2.94 (2.01–4.31)	1.70 (1.14–2.53)
	Level 3	1.48 (1.00–2.18)	1.11 (0.75–1.65)
	Level 4/5	1 (reference)	1 (reference)
Sex	Female		1.19 (1.03–1.39)
	Male		1 (reference)
Age (years)	16–24		0.23 (0.17–0.30)
	25–34		0.48 (0.37–0.63)
	35–44		0.71 (0.58–0.88)
	45–54		0.85 (0.71–1.02)
	55–65		1 (reference)
Educational level	Low		2.90 (2.28–3.70)
	Medium		1.66 (1.38–2.01)
	High		1 (reference)

sub-optimal SRH than men, but in Finland men were more likely than women to have sub-optimal SRH.

The prevalence of sub-optimal SRH increased considerably with age. Between 25 (Sweden) and 36% (Finland) of the >55-year-old cohort had sub-optimal SRH, compared with between 8 (Finland) and 11% (Sweden) of the 16–24 year olds. Educational level was also important: about 25% of respondents with a low educational level had sub-optimal SRH compared with 10% of respondents with a high educational level.

As regards literacy skills, between 28 (Norway) and 37% (Finland) of respondents with literacy scores at or below level 1 had sub-optimal SRH, whereas only between 7 (Sweden) and 9% (Norway) of the respondents performing at literacy level 4 or 5 did so.

Tables II–V show the results from the logistic regression models in relation to the association between literacy skills and sub-optimal SRH (model 1) with the covariates of sex, age and educational level (model 2). The reference categories in the models were literacy level 4/5, men, age 55–65 years and high educational level.

In model 1, having poor literacy skills (level ≤1) was strongly associated with having sub-optimal SRH in all four Nordic countries; the odds ratios ranged from 6.66 (95% CI 4.55–9.76) in Sweden to 3.84 (95% CI 2.72–5.42) in Norway (see Tables II–V). In addition, having literacy skills at level 2 was moderately (Denmark and Norway) to strongly (Finland and Sweden) associated with having sub-optimal SRH.

The results obtained by applying model 2, which included the covariates of sex, age and educational

Table III. Logistic regression of the association between literacy skills and sub-optimal self-reported health in **Finland** before and after controlling for sex, age and educational level.

	Variable	Odds ratio (95% confidence interval)	
		Model 1	Model 2
Literacy	Level ≤1	6.48 (4.84–8.66)	2.07 (1.48–2.90)
	Level 2	3.87 (3.02–4.96)	1.52 (1.15–2.01)
	Level 3	1.86 (1.45–2.38)	1.18 (0.91–1.53)
	Level 4/5	1 (reference)	1 (reference)
Sex	Female		0.76 (0.65–0.89)
	Male		1 (reference)
Age (years)	16–24		0.13 (0.10–0.18)
	25–34		0.22 (0.16–0.28)
	35–44		0.29 (0.23–0.38)
	45–54		0.53 (0.43–0.65)
	55–65		1 (reference)
Educational level	Low		2.57 (2.01–3.27)
	Medium		2.18 (1.81–2.63)
	High		1 (reference)

Table IV. Logistic regression of the association between literacy skills and sub-optimal self-reported health in **Norway** before and after controlling for sex, age and educational level.

	Variable	Odds ratio (95% confidence interval)	
		Model 1	Model 2
Literacy	Level ≤1	3.84 (2.72–5.42)	1.99 (1.36–2.92)
	Level 2	2.73 (2.01–3.71)	1.53 (1.09–2.15)
	Level 3	1.49 (1.10–2.03)	1.15 (0.83–1.58)
	Level 4/5	1 (reference)	1 (reference)
Sex	Female		1.22 (1.04–1.44)
	Male		1 (reference)
Age (years)	16–24		0.21 (0.16–0.28)
	25–34		0.42 (0.32–0.55)
	35–44		0.40 (0.31–0.52)
	45–54		0.64 (0.51–0.80)
	55–65		1 (reference)
Educational level	Low		2.64 (2.02–3.44)
	Medium		1.70 (1.40–2.07)
	High		1 (reference)

level, showed that Nordic respondents with literacy skills at or below level 1 were considerably more likely to have sub-optimal SRH than those with literacy level 4 or 5. Specifically, those with poor literacy skills were 1.99 (95% CI 1.36–2.92) times more likely than those with the best literacy skills to have sub-optimal SRH in Norway and 3.24 (95% CI 2.14–4.90) times more likely to do so in Sweden; the result in Denmark (2.90 times) was similar to Sweden, whereas the situation in Finland (2.07 times) was similar to that in Norway. For all four Nordic countries, having a low educational level rather than a high educational level was moderately strongly associated with having a sub-optimal SRH. In Finland and Norway, having a low educational

Table V. Logistic regression of the association between literacy skills and sub-optimal self-reported health in Sweden before and after controlling for sex, age and educational level.

	Variable	Odds ratio (95% confidence interval)	
		Model 1	Model 2
Literacy	Level ≤1	6.66 (4.55–9.76)	3.24 (2.14–4.90)
	Level 2	3.50 (2.46–4.98)	1.90 (1.29–2.78)
	Level 3	1.92 (1.35–2.72)	1.39 (0.96–2.00)
	Level 4/5	1 (reference)	1 (reference)
Sex	Female		1.49 (1.23–1.80)
	Male		1 (reference)
Age (years)	16–24		0.36 (0.26–0.49)
	25–34		0.44 (0.32–0.60)
	35–44		0.63 (0.48–0.84)
	45–54		0.79 (0.61–1.01)
	55–65		1 (reference)
Educational level	Low		2.75 (2.03–3.73)
	Medium		1.67 (1.33–2.09)
	High		1 (reference)

level was slightly more strongly associated with having a sub-optimal SRH than having literacy skills at or below level 1.

Discussion

Strong positive associations between sub-optimal SRH and low literacy skills were observed across the Nordic countries and the prevalence of sub-optimal SRH in specific socio-demographic groups across the countries was very similar. This might reflect a pattern common to these countries in terms of equal access to educational opportunities, health services and welfare systems. Nevertheless, even in the Nordic countries there are large groups of adults who have poor literacy skills, something that may restrict their ability to function in daily life in many ways, for example with respect to their health [4].

As expected, the prevalence of sub-optimal SRH increased with age and decreased with higher educational levels and stronger literacy skills. Having poor literacy skills, compared with high-level skills, was strongly associated with having sub-optimal SRH. These results are in line with previous research on functional health literacy [10]. Even after controlling for sex, age and educational level, Nordic respondents with literacy skills at the lowest level were more likely to report sub-optimal health than those with literacy skills at the highest levels. Given that strong correlations between SRH and actual health have been found in previous research [24,25], people with poor literacy skills can be considered to be at risk of sub-optimal health regardless of educational level.

As the Nordic countries provide a high level of equality of access to all levels of education [20], our finding that literacy contributes to explaining sub-optimal SRH beyond, and almost to the same extent as, educational level is a strong finding. In line with findings from previous research [10], these people might be less able to maintain their own health, to take medications correctly, and to interpret labels and health messages. Our results also indicate that a significant group in the Nordic countries is at risk of getting lost in the health care system and not succeeding in their role as health care consumers due to poor literacy skills.

To enhance public health, good literacy skills are needed in the population – hence public health is dependent on a good educational system where no child falls behind in literacy instruction. In addition, the school curriculum must entail health knowledge. As adults with low reading skills have an increased risk of poor health, low reading skills should be addressed by making adult education easily accessible. This includes immigrants with low reading skills in the language of their new country.

Sufficient literacy skills are necessary to take advantage of health-related information. This involves the simultaneous use of more complex and interconnected sets of abilities: to read and act on written information; to communicate needs to health professionals; and to understand different kinds of health-related instructions. Previous research has concluded that literacy skills predict health better than educational level [1,9]. In our study, however, this was found to be the case only for Sweden, whereas in Denmark the effect on sub-optimal SRH was similar for both literacy and educational level. Even so, literacy skills and educational level are known to be highly correlated [4] and the results obtained in this study show a moderate to strong association between literacy and sub-optimal SRH even in Finland and Norway, where educational level was the stronger predictor. Hence our results support the assumption that literacy skill is as an independent risk factor for poor health. As a significant part of the population has low literacy skills, not only traditional, written information should be used to disseminate health knowledge. Internet, films and photo stories can be important channels to enhance public health.

Our findings of better literacy skills in the younger population than in the older population may indicate that young people have easier access to, and a better understanding of, written health information. If so, this would give younger people a better basis for choosing a healthy lifestyle and prepare them better for functioning in a health care system that is growing increasingly complex. Moreover, given that

illness and the need to navigate the healthcare system and to take medication are more common in older people, and that having poor literacy skills is associated with a poor ability to interpret labels and health messages [10], difficulties in understanding health-related texts may have more serious consequences for older people. This is a situation that may exacerbate already existing inequalities in the health care system.

One implication of our findings of strong associations between sub-optimal SRH and poor literacy skills is that health professionals must be aware that a significant proportion of the population may have poor literacy skills and may therefore have problems understanding written health information. Health professionals should pay special attention to people without a higher education and ask whether they feel comfortable with reading and understanding current health information. Such people may be overwhelmed by commonly used medical jargon and by the complexity of medical explanations – for example, if prescriptions and drug labels are too complex – and especially if medical and pharmacy staff do not give oral advice in conjunction with new prescriptions. This has been identified as one of the principal causes of medication errors by outpatients [26,27]. To reach as many people as possible, written health information should be easily understandable, use clear language and have a logical structure. Jargon, acronyms and technical terms should be avoided whenever possible. Medication labels should use large font sizes and simple language [28]. In particular, important health information should be given orally as well as in writing, so that it may be verified that the recipient has understood it correctly.

The distribution of literacy skills in a country has consequences at both the individual and societal level. For a society, having a high percentages of adults with limited literacy skills is associated with lower health knowledge, higher health system costs and lower productivity [1,29]. Health care costs represent a large and growing share of total public and private expenditure, so finding ways to reduce costs and demands on the health care system is a collective priority. When it comes to individual people, inadequate literacy skills may result in less healthy life choices, riskier behaviour, less appropriate self-management of medication and more hospitalization.

A new group of concern is the expanding number of migrants and refugees who have come to the Nordic countries during recent years. Many of them have a low level of education, in addition to problems with understanding the language of their new country.

Having adequate literacy skills gives a person the platform necessary to access and understand written health information to maintain his or her own health

and prevent ill-health. Even in the Nordic countries, where access to good health care is equally distributed, adults with poor literacy skills are more likely than others to report sub-optimal health (and hence probably more likely to actually experience poor health), after sex, educational level and age are controlled for.

Strengths and limitations of the study

One strength of this study is the inclusion of a direct measure of literacy skills, the validity of which is well established and based on decades of work on reading surveys. Further, the respondents had access to the texts while they were answering the questions intended to measure their comprehension, meaning that the test required minimal working memory capacity – which is known to decline with age – and hence a possible confounding factor was eliminated [30]. With respect to the measure of the respondents' state of health, a direct measure of their health might be preferable, but SRH is well validated through earlier research and has been found to be highly correlated with mortality [24,25]. The study used representative, high-quality data from the first round of PIAAC. The samples were very large, including more than 22,000 Nordic respondents.

One limitation of this study was that the >66-year-old age group was not included in PIAAC. Earlier studies strongly indicate that average literacy skills are poorer in that age group [14].

It is important to note that this study is based on cross-sectional data and thus cannot properly be used as a basis for making causal inferences. In other words, even though we claim that poor literacy skills may affect health, we suggest that poor health may, inversely, lead to poor literacy skills. This applies, in particular, to the oldest section of the population and to the institutionalized or hospitalized part of the population, neither of which was included in PIAAC. In addition, this study did not provide information on how or to what extent the respondents applied health information, only whether they had the skills needed to understand written health information.

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