Lifelong Educational Practices and Resources in Enabling Health Literacy Among Older Adults Journal of Aging and Health 22(6) 827–854 © The Author(s) 2010 Reprints and permission: sagepub.com/journalsPermissions.nav DOI: 10.1177/0898264310373502 http://jah.sagepub.com



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Abstract

Objectives: The goal of this study is to examine the role of lifelong educational and learning practices and resources in enabling health literacy. **Method:** A subsample of older adults (n = 2,979) derived from the 2003 seven country IALSS (Canadian survey) was used. An expanded Andersen-Newman model that included lifelong learning enabling factors was used to develop predictors of health literacy. **Results:** The formal education, lifelong and lifewide learning enabling factors exhibited the most robust associations with health literacy. These included education level; self-study in the form of reading manuals, reference books and journals; computer/Internet use, use of the library; leisure reading of books; reading letters, notes and e-mails; and volunteerism. **Discussion:** Findings are discussed in relation to the development and maintenance of health literacy over the life course.

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Programs and policies that encourage lifelong and lifewide educational resources and practices by older persons are needed.

Keywords

health literacy, educational resources, lifelong learning, older adults

Introduction

Health literacy is defined as "the degree to which individuals have the capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions" (Ratzan & Parker, 2000, p. vi). For older adults, health literacy skills are fundamental to the maintenance of quality of life in virtually all realms. These skills are necessary to understand the risks and benefits of medical treatments(s) and to give informed consent; to navigate the health care system; and to maintain healthy lifestyles and effective self-management of illness (Canadian Council on Learning, 2007; Wolf, Gazmararian, & Baker, 2005). Health literacy skills are also needed to take or administer medications appropriately—an area of significant concern as individuals age (Canadian Public Health Association & National Health Literacy Program, 2002). In fact, adults with low functional health literacy are twice as likely to be hospitalized as people with high functional literacy (Baker et al., 2002) and are more likely to die (Baker et al., 2007).

It has been estimated from the Canadian version of the 2003 International Adult Literacy and Life Skills Survey (IALSS) that a striking 88% of older Canadians possess below fundamental levels of health literacy (Canadian Council on Learning [CCL], 2007). The economic impact of low health literacy may be substantial. The Institute of Medicine's Expert Committee on Health Literacy found in-patient spending for a person with poor reading skills to be US\$450 higher than for a person with adequate reading skills after controlling for health status (Institute of Medicine, 2004).

Studies have begun to identify a number of potential correlates of health literacy; however, few have attempted to understand educational and learning pathways that lead to enhanced health literacy over the life span. Although there has been numerous studies establishing the importance of lifelong learning occurring in formal educational environments, research has begun to expand this concept to encompass a broader set of informal environments in which people learn—termed "lifewide learning" (Aspin & Chapman, 2000; Glastra, Hake, & Schedler, 2004; Pamphilon, 2005). The development and maintenance of health literacy skills over the life course may therefore take many forms—ranging from formal channels, such as adult education and seminars, to more informal types of learning, such as self-study, Internet use, library use, and daily reading practices; to engagement in social networks, such as volunteerism. Moreover, most studies have focused on younger or middle-aged populations, with relatively limited research conducted on the health literacy dynamics among older adults. Another issue has been that most studies are correlational; therefore, it is not clear whether reading practices, for instance, affect health literacy or visa versa. The present study explores a comprehensive set of predictors of health literacy with a focus on the lifelong enabling role that educational resources and more informal lifewide learning practices play in the development and maintenance of health literacy in old age.

Theoretical Framing and Review of Lifewide Learning and Health Literacy

Health literacy relates to the degree to which individuals can make appropriate health decisions based on access and barriers to obtaining, processing, and understanding health information. It therefore includes general cognitive abilities (e.g., working memory and processing speed) as well as literacy/ reading skills (Levinthal, Morrow, Tu, Wu, & Murray, 2008). Health literacy is fundamental to health care utilization; prevention and self-care; and maintaining healthy lifestyles as we age. The Andersen-Newman model (Andersen, 1995) is combined with concepts drawn from lifelong learning as an overarching framework to investigate predisposing, enabling, and need factors as predictors of an adequate level of health literacy. According to the original version of the Andersen-Newman model, predisposing characteristics, enabling resources, and need variables act together to influence the use of health services by individuals, thus affecting health outcomes (Andersen, 1995). It has been useful in explaining numerous types of health resources use as well as related health behaviours engaged in by older adults (Lai & Kalyniak, 2005; Wister et al., 2002; Wolinsky & Johnson, 1991).

Demographic characteristics, social structural variables, and health beliefs are typically considered to be *predisposing factors* in the Andersen-Newman model (Andersen, 1995). Based on several studies, it has been found that individuals who are older (elderly), immigrants, non-English-speaking, persons who belong to a racial/ethnic minority group, and those residing in rural areas are predisposed to low literacy including health literacy (CCL, 2008; Rudd, Kirsch, & Yamamoto, 2004; Wolf et al., 2005). Being male has also been reported as a predictor for low health literacy although not consistently (Sudore et al., 2006). In addition, parental education can act as a predisposing factor for health literacy. For instance, it has been found that family background (measured by parents' level of education) exhibited a moderate and positive association with health literacy scores (CCL, 2008). That is, children who have more highly educated parents tend to complete higher levels of education that in turn have a strong indirect influence on the development and maintenance of literacy¹ as they move through their life course (Desjardins, 2003).

Thus our expectations are that being a woman; having parents with a higher level of education; living in an urban area, and in the Western region of Canada; being a nonimmigrant; and practicing the language of the test in a home context are all factors that are meaningfully associated with higher levels of health literacy.

According to Andersen & Newman (1973), and Andersen (1995), *enabling factors* comprise the second domain of influence, reflecting conditions that affect access to health resources. We suggest that enabling factors applied to health literacy may originate from individual educational levels and lifelong learning practices that may take a variety of forms. Educational and learning practices as well as resources can be conceptualized as enabling factors that promote or inhibit the development and maintenance of health literacy over the life course of individuals. These may take the form of formal education as well as lifelong educational practices. Analyses of the Health Activities Literacy Scale (HALS) linked to the U.S. National Adult Literacy Survey (Rudd et al., 2004) and the Canadian Council on Learning (CCL, 2008) have demonstrated that educational level is strongly related to educational skills including those required for health literacy based on analyses of the general population. It is assumed that these effects remain in old age, but may be modified based on an individual's continued use of these skills.

Lifelong and lifewide learning practices include engagement in adult education, seminars, training, as well as more informal types of learning, such as reading at the library, using the Internet for knowledge, and engaging in social activities or organizations, which foster knowledge-based skills. There is a plethora of literature showing the significance of lifelong (formal) and lifewide (informal) learning for positive outcomes among older individuals, such as mental fitness (Cusack & Thompson, 2006; Pamphilion, 2005). A central enabling pathway is reading practice, namely, the more print reading that an individual engages in, the greater their vocabulary, conceptual knowledge and cognitive skills become (Baker, 2006; Cunningham & Stanovich, 2003). This has been borne out in the HALS data where average HALS proficiency of the adult population varied by reading engagement (Rudd et al., 2004). The more educated and those who practice reading more often are better able to process information about health practices and healthy lifestyles (Roberts & Fawcett, 2003), giving them a cumulative advantage over the life span with respect to health and aging (Desjardins, 2003; O'Rand & Hamil-Luker, 2005).

Engagement in educational pursuits over the life course is a strong predictor of health literacy in old age, given the association between learning processes and reading comprehension (Desjardins, 2003; Morrow et al., 2006). Based on our theoretical framework, one would expect that access to reading materials through the library, Internet, media, or other sources would facilitate health literacy by providing opportunities to practice and enhance reading comprehension pertaining to the prevention, diagnosis, treatment, and management of health problems, such as arthritis, cancer, heart disease, or diabetes. It is interesting that one study found that literacy practices at home (e.g., reading books, magazines, and newspapers) exerted a stronger effect on health literacy than educational attainment (CCL, 2008). This may reflect the importance of lifelong learning and reinforcement of reading comprehension and problem-solving skills in everyday contexts, especially given the increasing complexity of health information (Baker, 2006; Rudd et al., 2004). All of these forms of learning may have a substantive educative impact on individuals over the entire life course, but they may be especially important in later stages where the initial cycle of formal education has long passed (Desjardins, 2003). Participation in such activities may provide individuals with an opportunity to gain or exercise existing, health literacy-related skills (e.g., problem solving, mathematical, or reading skills). For instance, library use may increase one's propensity to engage in literacy or learning-related practices because of the breadth of educational and vocabulary expanding resources and practices available to individuals. Also, the importance of the Internet as a source of health information has been established in the literature (e.g., Sinden & Wister, 2008). We also include social engagement as a salient enabling factor affecting health literacy because of the potential to learn through communication and interaction. This may include involvement in community organizations, such as a church, or through membership or volunteerism. Rudd et al. (2004) have shown that civic engagement (voting, library use) is correlated with higher literacy in the adult population. Finally, household income is considered an enabling factor for health literacy because it may provide access to both formal and informal learning activities and resources, apart from its association with formal education. Wealth status has also been correlated with literacy in the HALS based on the adult population of the United States. (Rudd et al., 2004). Thus we hypothesize as follows:

Hypothesis 1: engagement in, or possession of, enabling resources (through higher levels of education, literacy and learning-related practices, Internet use, involvement in community organizations and volunteerism, and economic resources) will be predictive of health literacy.

The salience of educational resources for health literacy and the complex interrelationships among them make these variables focal relationships of interest from a theoretical perspective (Aneshensel, 2002). We will therefore explore whether past education, or more current learning practices and resources, are more important enablers of health literacy as well as whether the effect of completed formal education is mediated by current lifelong learning experiences.

The third component of the Andersen-Newman model is *need factors*, which often motivate individuals to seek assistance or make behavioral changes consistent with the goal of improving or maintaining their health. Perceived and evaluated illness represent need factors within the Andersen-Newman model (Andersen & Newman, 1973). In terms of health literacy, this may act in two different ways. First, poor health increases the need for health literacy skills to engage in preventive health behaviors (e.g., physical activity), selfcare, and maintenance of illness symptoms—particularly for older adults because they are more likely to experience health problems. Second, it is also recognized that poor health may act as a barrier to health literacy, especially through sensory and cognitive impairment.

In past research, health-related variables have largely been treated as outcomes of health literacy despite the fact that normal physical changes that occur with aging, such as uncorrected visual problems, have been cited as a contributor to reading and comprehension difficulty (Canadian Public Health Association & National Literacy and Health Program, 2002; Statistics Canada, 2003). It is understood that there are numerous age-related physical and mental health problems (i.e., dementia, stroke, depression, etc.) that may cause literacy ability to deteriorate (Baker, Gazmararian, Sudano, & Patterson, 2000). Research has shown that older adults with low levels of reading proficiency² tend to report lower perceived health, more chronic conditions, activity restrictions due to physical and mental limitations, pain that interferes with normal work activities, and lower mental health (CCL, 2008; Wolf et al., 2005). Older Americans with limited reading proficiency were also shown to have a significantly higher risk of death as compared those with adequate literacy (Baker et al., 2007; Sudore et al., 2006). Overall, uncorrected visual problems (Canadian Public Health Association & National Literacy and Health Program, 2002), dementia or cognitive impairment, chronic diseases that may impair cognitive function, poor physical health, poor mental health, and pain and sensory impairment have been cited as potential contributors to low literacy (Baker et al., 2000). Although hearing or vision loss might be considered to act as a barrier/enabler, we incorporate all health measures in the need block together in our analysis. We therefore hypothesize as follows:

Method

We used data for Canada derived from the 2003 International Adult Literacy and Life Skills Survey (IALSS).³ The IALSS was a product of an international research consortium that represented seven countries. The study aimed to investigate the ways in which adults used printed information to function in society (Murray, Clermont, & Binkley, 2005). Using a cross-sectional, multistage sampling household survey design, a variety of background information was collected for Canadians aged 16 years of age and older (representing 98.5% of the population) including self-reported health status, engagement in education and learning activities, reading practices and a range of other healthrelated determinants (Statistics Canada, 2003).⁴ The background questionnaire took about 30 min to complete, and the full questionnaire took approximately 1 hr. It is important to note that respondents were given as much time as they needed to complete the test. These data were ideal because the sample size was large and several subgroups were oversampled such as aboriginals and immigrants. Furthermore, interviewers were present in respondents' homes to assist with the background questionnaire as well as to administer directly an internationally developed literacy test. It must be noted that the 2003 version of the IALSS was the first to collect information from Canadians above the age of 65. Prior to 2003, the IALSS had not been administered to this segment of the population.

The Sample

For this study, we use the subsample of seniors who were aged 66 and above. Although age 65 and above is the more typical cutoff, the one available in

Hypothesis 2: An absence of disease and pain will be predictive of health literacy.

these data was 66 and above. Results should be interpreted with this cut-point in mind. Individual age was not released in the public sample tapes and was therefore excluded as a predisposing factor. Excluded from the survey were seniors living on Aboriginal reserves, in institutions, and in sparsely populated regions (Murray et al., 2005). This is common in most national surveys, including those conducted by Statistics Canada, due to the high nonresponse in those settings.

Descriptive statistics show that the unweighted sample was comprised of 1,310 (44%) males and 1,669 (56%) females. The majority of participants (70.7%) lived in urban communities and were born in Canada (79.5%). Geographically, the sample⁵ was drawn from Quebec (8.9%) plus the Atlantic (26.5%), central (28%), Western (30.7%), and Northern (5.9%) regions of Canada. The majority of participants (58.9%) had attained "primary education or less" and earned less than US\$25,000 per year (45.7%). Most of the participants rated their health as "good" (33.2%) and reported an absence of pain, visual impairments, hearing impairments, depression, and disability (44.2%, 73.5%, 72.3%, 44%, and 68.7% respectively). In comparison to 2003 population statistics, the unweighted sample overrepresented less educated seniors and underrepresented those with a high school and nonuniversity postsecondary level of education (Turcotte & Schellenberg, 2007). Our sample also overrepresented older adults with hearing and uncorrected visual problems (Millar, 2004). Using the population weight provided by Statistics Canada, all results reported in this article are adjusted for known population estimates of major sampling stratifiers such as province, community size, age, gender, and level of education.

Dependent Variable

Health literacy. In total, 191 (or 55%) of the 350 literacy tasks contained within the IALSS (2003) were judged to measure health-related activities (CCL, 2008). Responses to the health literacy-related questions were scored by the authors of the IALSS using Item Response Theory (IRT),⁶ with scores ranging from zero to 500. In turn, these scores correspond to five levels of literacy, each signifying an increased level of difficulty. A sample of a health literacy-related task can be found in appendix.

Health literacy scores for Canadians 66 years of age and older ranged from 0 to 482.9 (approximate M = 206.5). Because we were interested in identifying predictors of an adequate level of health literacy in our sample, we dichotomized the health literacy scores into two categories, below adequate (scores of less than 276, or Level 2 or less) and adequate (scores of 276 or higher, or

Level 3 or higher). We chose this cutoff because Level 3 is the benchmark for functional literacy in developed countries, and given that an international expert panel deemed Level 3 to be a minimum level for needed to be functionally literate (Murray, Kirsch & Jenkins, 1997; Organisation for Economic Co-operation and Development & Human Resource Development Centre, 1997; Statistics Canada, 2003). Health literacy is an ad hoc variable that is derived from the health-related test items used to scale the prose and document literacy variables, so we employ the same cutoff to define functional health literacy.

To achieve a score equal to Level 3 (i.e., the minimum level needed to be deemed functionally literate) on the IALSS (2003) health literacy scale, three conditions must be met: (a) an individual must be able to integrate multiple pieces of information presented in a dense or lengthy text, (b) an understanding of mathematical information presented in a number of different formats must be demonstrated, and (c) an individual must be able to carry out a number of steps or processes to solve problems (CCL, 2007). Scores below Level 3 on the IALSS (2003) health literacy scale thus represent a failure to meet all of the aforementioned conditions. Scores at or above Level 3, on the other hand, are indicative of an adequate level of health literacy.

Independent Variables

A comprehensive set of variables were selected from the IALSS (2003) to represent the predisposing, enabling, and need factors. Table 1 shows the frequency distributions for the 6 predisposing, 22 enabling, and 6 need factors. For variables with missing cases, there were less than 0.2% missing, which can be ignored without affecting the parameter estimates (Tabachnick & Fidell, 2007). The one exception is for parental education (9.9% missing), where the missing were recoded to the modal category of the three-level ordinal variable.

Measurement of predisposing factors. The six variables selected to represent the predisposing factors include gender, community size, province, year of immigration, language spoken most often at home, and parents' highest level of education. Community size was divided into rural and urban. Province was collapsed into five regions: Atlantic (Newfoundland, Prince Edward Island, Nova Scotia, and New Brunswick), Quebec, Ontario, Western (Manitoba, Saskatchewan, Alberta, and British Columbia), and Northern (North West Territories, Yukon, Nunavut), which are typical provincial clusters in Canadian research. Year of immigration was collapsed into four categories signifying recent immigrant (1994-2003), established immigrant (1974-1993)

(text continues on pg. 13)

Variables	Categories	Frequency	Percentage
Gender	Male	1310	43.5
	Female	1669	56.5
Community size	Rural	873	20.7
	Urban	2106	79.3
Province	Atlantic	790	7.7
	Quebec	265	24.5
	Ontario	833	38.5
	Western	915	29.2
	Northern	176	0.1
Year of immigration	1994-2003	41	0.9
C	1974-1993	116	5.6
	1900-1973	450	22.6
	Nonimmigrant	2368	70.7
	Missing	4	0.2
Language spoken at home	Same as test language	2430	84.4
	Different from test language	549	15.6
Parent's highest level	Less than secondary	1934	60.2
of education	Completed	448	18.9
	Higher than	280	11.0
	Missing	317	99
Education loval	Primary or loss	1755	54.0
	Some secondary	530	212
	Completed secondary	211	21.3
	Postsecondary,	190	7.7
	University	292	9.1
	Missing		0.2
Household income	CDN\$25.000 or less	1361	39.6
(per annum)	CDN\$25,000.01 to CDN\$50.000	916	33.4
	CDN\$50,000.01 to CDN\$90,000	296	12.1
	more than CDN\$90,000	107	4.4
	Missing	299	10.5
Participation in adult	No	2754	91.6
education	Yes	224	8.4
	Missing	I	0.0

Table 1. Weighted Frequency and Percentage for All Categorical Variables

Table I. (continued)

Variables	Categories	Frequency	Percentage
Read manuals, reference	No	1968	64.5
books, journals to learn	Yes	1010	35.5
· •	Missing	1	0.0
Computer or Internet	No	2569	86.4
to learn	Yes	409	13.6
	Missing	I	0.0
Use of video/TV to learn	No	2237	75.2
	Yes	741	24.8
	Missing	I	0.0
Trying/practice on own	No	1163	42.6
to learn	Yes	1813	57.3
	Missing	3	0.1
Visit trade fairs or	No	2696	90.0
conferences	Yes	281	10.0
	Missing	2	0.0
Attend lectures, seminars	No	2556	85.2
or workshops	Yes	421	14.8
	Missing	2	0.0
Go on guided tours	No	2475	82.7
8	Yes	503	17.3
	Missing	1	0.0
Learn by watching or	No	1732	59.7
getting help	Yes	1245	40.2
88F	Missing	2	0.1
Learn by being sent to an	No	2772	93.1
organization	Yes	205	6.9
0	Missing	2	0.0
Visit library	Never	1951	63.6
,	Once or twice a year	345	10.7
	Several times a year	181	6.7
	, Monthly	279	10.7
	Weekly	222	8.3
	Missing	I	0.0
Read newspaper	Never	391	10.5
	Rarely	191	6.3
	Less than once a week	143	4.2
	At least once a week	2253	78.9
	Missing	I	0.0
Read or use magazines	Never	695	17.9
0	Rarely	519	17.6

Variables	Categories	Frequency	Percentage
	Less than once a week	462	15.4
	At least once a week	1302	49.0
	Missing	I	0.0
Read books (fiction or	Never	1068	28.5
nonfiction	Rarely	523	18.7
,	Less than once a week	298	9.6
	At least once a week	1086	43.1
	Missing	4	0.0
Read letters, notes or	Never	3	43.4
e-mails	Rarely	644	21.2
	Less than once a week	338	12.3
	At least once a week	684	23.0
	Missing	2	0.1
Volunteer fundraiser	No	2447	84.6
	Yes	530	15.3
	Missing	2	0.1
Volunteer board member	No	2619	88.8
	Yes	358	11.2
	Missing	2	0.0
Volunteer coach or	No	2737	92.0
counsellor	Yes	240	7.9
	Missing	2	0.1
Volunteer to collect food	No	2403	80.7
or goods	Yes	574	19.2
6	Missing	2	0.1
"Other" volunteer	No	2638	88.8
	Yes	339	11.2
	Missing	2	0.0
Self-perceived health	Poor	244	6.6
·	Fair	724	22.8
	Good	990	34.6
	Very good	711	24.3
	Excellent	308	11.7
	Missing	2	0.0
Pain interfering with	Extremely	172	5.7
work	Quite a bit	376	11.6
	Moderately	372	11.9
	A little of the time	739	24.8
	None of the time	1317	46.0
	Missing	3	0.0

Table I. (continued)

Variables	Categories	Frequency	Percentage
Vision problem	Current problem	576	16.9
·	Had a problem, but recovered	214	6.7
	Never had a problem	2189	76.4
Hearing problem	Current problem	784	26.3
	Had a problem, but recovered	42	1.2
	Never had a problem	2153	72.4
Disability of 6 months or	Current problem	751	23.8
more	Had a problem, but recovered	181	6.1
	Never had a problem	2047	70.1
Felt downhearted or blue	All of the time	33	0.8
	Most of the time	104	3.3
	A good bit of the time	137	4.9
	Some of the time	554	19.5
	A little of the time	880	29.0
	None of the time	1310	42.3
	Missing	11	0.1
Health literacy	Levels I & 2 (Inadequate)	2635	87.7
	Levels 3 & 4/5 (Adequate)	344	12.3

Table I. (continued)

long-established immigrant (1900-1973) and nonimmigrant. Language spoken most often at home was collapsed into two categories: language spoken at home is different than the language of the IALSS test; and language spoken at home is same as the language of test. Parents' highest level of education (i.e., highest of either mother or father) was collapsed into three categories: less than upper secondary, completed upper secondary, and higher than upper secondary.

Measurement of enabling variables. Twenty-two enabling variables were chosen for inclusion. These were divided into education/income, self-study enablers, reading practice enablers, and volunteerism enablers. Level of educational attainment was collapsed into five categories: primary or less, some secondary, completed upper secondary, postsecondary (nonuniversity), and university. Household income was collapsed into four categories: CDN\$25,000 or less, CDN\$25,000.01 to CDN\$50,000, CDN\$50,000.01 to CDN\$90,000,

and more than CDN\$90,000. Visits to the library were ranked according to five categories: never, rarely, once in a while, at least once a week, and weekly. The reading or use of four types of materials (i.e., newspapers, magazines, books, letters/notes/e-mails) in daily life were coded as *never*, *rarely*, *less than once a week*, or *at least once a week*. The remaining 15 enabling variables related to learning⁷ and civic engagement⁸ were dichotomized into yes/no responses.

Measurement of need factors. The need factors encompassed six healthrelated variables: self-perceived health, pain interfering with normal work, depression (feeling downhearted or blue), vision, hearing, and disability. Self-perceived health was ranked based on five categories: poor, fair, good, very good, and excellent. Pain interfering with normal work included five categorical options: extremely, quite a bit, moderately, a little bit, and not at all. Feeling downhearted or blue was scored according to five categories: all of the time; most of the time; a good bit of the time; some of the time; and a little of the time. The last three need factors: ever having an eye or visual problem of the kind that is not correctable by glasses; ever having a hearing problem; and ever having a disability or health problem of 6 months were ranked in a similar manner. The categorical options for three aforementioned variables were as follows: has a current problem, had a problem but recovered, and never had a problem.

Results

We used the logistic regression method to examine the predisposing, enabling, and need factors as predictors of an adequate level of health literacy, which has been dichotomized into an adequate/inadequate level of health literacy and referred to as health literate or not. Design-based standard errors were calculated using a tool provided by Statistics Canada called STATOOL, which is a SAS macro that operationalizes the jackknife method of calculating design-based standard errors for complex samples.⁹ Four models were tested. The predisposing factors were placed into Model 1 because they tend to chronologically precede both the enabling and need factors. Level of education and household income were placed in the second model to examine them separately because income and education can measure financial enabling resources as well as learning ones. The remaining enabling factors included measures of lifelong and lifewide learning, including self-study, reading, and volunteerism enablers. These were placed in the third model and the need factors in the fourth. This sequence is ordered according to the Anderson-Newman model (Andersen, 1995; Wister et al., 2002).

Logistic Regression Findings for an Adequate Level of Health Literacy

Predisposing factors. The results of the four models are shown in Table 2. One predisposing, 13 enabling, and 1 need variable exhibited statistically significant associations. Only results from the fourth model are discussed, except where results significantly differ in earlier models. The findings indicate that older adults living in the West were more likely to be functionally literate in the health domain (odds ratio = 1.7) in comparison to those residing in the Atlantic. The other five predisposing variables (gender, community size, year of immigration, language spoken at home in comparison to test language, and parents' level of education) were not found to be statistically significant in the fully adjusted model; however, living in Ontario (compared to the Atlantic), language, and parent's education were statistically significant up until the inclusion of the income and education block in Model 3.

Education/income enablers. Health literacy was associated with persons having some secondary, upper secondary, nonuniversity postsecondary, and university levels of education (in comparison to those with a primary level or less; odds ratios = 2.5, 3.2, 3.8, and 3.5 respectively). It should also be noted that the odds ratios for education level dropped significantly after the inclusion of the self-study, reading practice, and volunteerism enablers. Also, household income was statistically significant in Model 3, but not in the subsequent models.

Self-study enablers. A number of self-study variables were associated with health literacy. Older adults who read manuals/reference books/journals to learn (odds ratio = 2.1) and those who used the computer or Internet to learn (odds ratio = 3.9; relative to those who did not) were more likely to be health literate. In addition, compared to not using a library, visits to the library "once or twice a year" increased the likelihood of being health literate (odds ratio = 1.9). Visits to the library on a "weekly," "monthly," or "several times a year" basis, on the other hand, did not. Watching a video or television, visiting trade fairs or conferences, attending lectures/seminars/workshops, going on guided tours, or watching others or getting help were also not statistically important predictors. One surprising finding showed that learning opportunities associated with being sent to an organization to learn lowered the probability of being health literate (odds ratio = 0.6). Participation in adult education in the last 12 months was also not statistically associated with health literacy.

Reading practice enablers. With respect to the influence of reading practices, older adults who read books (fiction or nonfiction) at least *once a week*

Variables	Model I	Model 2	Model 3	Model 4
Predisposing factors				
Female (male)	1.0	1.0	0.9	0.8
Urban (rural)	1.2	1.4	1.3	1.2
Province/region (Atlantic)				
Quebec	0.7	0.8	1.0	0.8
Ontario	1.5*	1.5**	1.3	1.3
Western	2.4***	2.4***	1.6*	1.7*
Northern	1.5	1.6	0.8	0.9
Year of immigration (1994-2003)				
1974-1993	3.2	4.2	3.5	4.1
1900-1973	2.2	2.1	1.5	1.4
Nonimmigrant	1.9	2.2	2.0	1.9
Language spoken at home same	3.4***	2.6**	1.7	1.8
as test language (different than				
language of test)				
Parent's education				
(< than secondary)				
Completed secondary	3.6***	1.8*	1.4	1.4
Higher than secondary	3.0***	1.2	0.8	0.7
Enabling factors				
Education level (primary or less)				
Some secondary		3.6***	2.4**	2.5**
Completed secondary		5.0***	3.1***	3.2**
Postsecondary, nonuniversity		6.7***	4.0***	3.8 ^{∞∞∗}
University		9.9***	3.3***	3.5***
Household Income (CDN\$25,000) or less)			
CDN\$25,000.01 to	,	1.7**	1.6	1.5
CDN\$50,000.00				
CDN\$50,000.01-CDN\$90,000		1.9*	1.6	1.4
More than CDN\$90,000		1.3	1.1	1.1
Self-study enablers				
Participation in adult			1.3	1.4
education (no)				
Read manuals, reference			2.0****	2.1***
books, journals to learn (no)				
Computer or Internet to learn (no)			3.9***	3.9***
Video or TV to learn (no)			0.8	0.8
Trying or practice on own (no)			0.8	0.8
Visit trade fairs or conferences (no)			0.9	0.9

 Table 2. Logistic Regression Showing Odds Ratios for Predictors of Adequate

 Health Literacy, Canada, 2003

Variables	Model I	Model 2	Model 3	Model 4
Attend lectures, seminars,			1.2	1.3
workshops (no)				
Go on guided tours (no)			1.1	1.2
Learn by watching or getting			0.7	0.8
help (no)				
Learn by being sent to an			0.6	0.6*
organization (no)				
Visit library (never)				
Once or twice/year			2.2**	1.9*
Several times/year			1.4	1.4
Monthly			1.3	1.3
Weekly			1.2	1.1
Reading practice enablers				
Read newspapers (never)				
Rarely			0.9	0.9
Less than once a week			1.3	1.4
At least once a week			0.7	0.7
Read/use magazines (never)				
Rarely			1.7	1.6
Less than once a week			2.4	2.2
At least once a week			2.3	2.0
Read books (never)				
Rarely			2.0*	2.0
Less than once a week			1.3	1.3
At least once a week			4.3***	4.5***
Read letters, notes, e-mails (n	ever)			
Rarely			3.3***	3.4***
Less than once a week			3.1**	3.0**
At least once a week			1.9	2.1*
Volunteerism enablers				
Fundraiser (no)			1.6**	1.7**
Board member (no)			0.7	0.7
Coach, teach, counsel (no)			1.1	0.9
Collect food or goods (no)			1.2	1.1
Other (no)			1.6	1.7*
Need factors				
Self-perceived health (poor))			
Fair				0.5
Good				0.8
Very good				1.3
Excellent				1.0

Variables	Model I	Model 2	Model 3	Model 4
Pain interfering with work (extremely)			
Quite a bit	,,			1.0
Moderately				1.1
A little bit				0.8
Not at all				0.8
Feel downhearted (all of the	e time)			
Most of the time	,			4.3
A good bit of the time				1.2
Some of the time				3.7
A little of the time				4.3
None of the time				2.6
Vision problem (current pro	oblem)			
Had problem, but				1.0
recovered				
Never had a problem				0.6
Hearing problem (current				
problem)				
Had problem, but				0.2
recovered				
Never had problem				1.0
Disability of 6 months or $>$				
(current problem)				
Had problem, but				1.8
recovered				
Never had a problem				19*
Model chi-square	210 04***	419 47***	735 9***	790 98***
Cox Spell	0.068	0 131	0219	0.232
	0.000	0.151	0.217	0.255

Table 2. (continued)

Note: Likelihood of being at a medium to high (Level 3 & 4/5) level of health literacy (coded 1) compared to a low (Level 1 & 2) level of health literacy (coded 0). Reference categories shown in parentheses.

*p < .01 **p < .05. ***p < .01.

were more likely to possess adequate health literacy in comparison to those who never read books (odds ratio = 4.5). Reading letters/notes/emails *rarely* or *less than once a week* (compared to *never*) was also positively associated with being health literate (odds ratio = 3.4 and 3.0 respectively). The reading, or use of, other materials (i.e., newspapers and magazines) in daily life, however, were not statistically important.

Volunteerism enablers. Health literacy was associated with some forms of volunteerism. Older persons who participated in fundraising or "other"

volunteer activity (in comparison with those reporting no volunteer involvement) had an adequate health literacy (odds ratio = 1.7 for each one).

Need factors. Turning to the need factors, the likelihood of adequate health literacy was higher (odds ratio = 1.9) for older persons who reported "never having had a disability of 6 months or more" (in comparison to those reporting a current disability of 6 months or more). The five remaining need factors (self-perceived health, vision problems, hearing problems, pain, and depression) were not statistically significant.

Discussion

Health literacy skills are needed to "access, understand, appraise, and communicate health information" (Rootman & Gordon-El-Bihbety, 2008, p. 11). For this reason, health literacy is needed to promote and maintain good health. The central tenant of this article is that these skills are part of an individual's accumulated lifelong and lifewide learning experiences from formal and informal sources, which are not determined solely by educational attainment earlier in life (Desjardins, 2003). Because older adults are more likely to experience health problems, use the health care system, and manage multiple prescriptions and illnesses, this study aimed to explore predictors of health literacy specifically among older adults. Framed by the Andersen-Newman model and coupled with a lifelong learning perspective, this research investigated groupings of predisposing, enabling, and need factors that may influence adequate level of health literacy in older Canadians. Our focus relationships included educational and learning practices, resources, and processes that enable individuals to foster and maintain health literacy as they age.

Strikingly, only 12% of older adults participating in the 2003 International Adult Literacy and Life Skills Survey (IALSS) were estimated to possess an adequate level of health literacy (Level 3 or higher), which matches other findings based on these data (see, for example, CCL, 2008). Multivariate findings based on logistic regression support a regional difference in health literacy, where seniors living in the West (compared to those in the East) report higher health literacy. This finding mirrors those found for younger and middle-aged adults (CCL, 2007) and may be indicative of historical literacy tape-recorded disparities. None of the other predisposing factors (gender, community size, year of immigration, language spoken at home relative to the test language, and parents' level of education) were found to affect the likelihood that older adults are health literate once all of the variables were statistically controlled. We also hypothesized that higher levels of education, as well as engagement in adult education, self-study and learning practices,

Internet use, and engagement in community organizations and volunteerism, would enable older persons to develop and maintain adequate health literacy. In addition, it was anticipated that income would facilitate health literacy by providing financial resources to support health literacy skills. Our findings clearly support the salience of educational and learning practices and resources, especially those that stem from informal lifewide activities in old age (Aspin & Chapman, 2000; Glastra, Hake & Schedler, 2004; Pamphilon, 2005). The probability of being health literate was considerably higher among participants possessing a level of formal education beyond primary school; those who engaged in self-study practices (read manuals/reference books/journals, use computer/Internet, and use library); those who read letters and e-mails; those who read certain types of leisure materials; and those who took part in volunteer activities. Income was only supported in the initial model in which it was entered, with its effect subsumed by the educational and learning practices and resources.

The emergence of higher levels of formal education as a predictor of adequate health literacy was expectedly given the very strong and positive association reported in prior research (e.g., CCL, 2008; Desjardins, 2003; Morrow et al., 2006). Noteworthy is the finding that the strength of the formal education associations with health literacy decreased significantly after the self-study, reading practices, and volunteer enablers representing lifewide learning were included in Model 3. This suggests a mediating effect of lifewide learning on formal education. It is also consistent with literature that identifies a gap between an individual's capacity to communicate based on education and their print and oral health literacy (Baker, 2006). It is also interesting, however, that the associations for secondary levels of education and beyond were roughly comparable in the final Model. This suggests that the effects of higher learning on health literacy skills may converge to a normative level over a long period of time. Older adults who fail to complete high school, on the other hand, are significantly less likely to be health literate relative to their more educated counterparts, which points to a potential threshold effect.

We also found that older adults who read manuals, reference books, or journals to learn and those who use the computer or Internet to learn were more likely to be health literate than those not engaging in these types of learning practices, with Internet use exhibiting one of the strongest associations. These findings underscore the relatively broad spectrum of activities by which a person can engage in lifewide learning and foster health literacy in a rapidly changing and complex society. They also suggest that informal channels of lifewide learning may be effective pathways to maintaining or fostering health literacy among older adults through enhancing reading and cognitive skills as found in studies of younger age groups (Cunningham & Stanovich, 2003). The strength of the association between computer/Internet use and health literacy is particularly interesting, given the spread of computer technology and computer literacy in society (Sinden & Wister, 2008). Although some of the other types of formal and informal forms of learning were not supported (trade fairs or conferences, being sent to an organization to learn, lectures, watching a video or television, guided tours, or watching others or getting help), apart from watching television, many of these learning styles do not affect a large number of older adults and therefore it is not surprising that they were found to be ineffective in affecting health literacy in this study.

Furthermore, seniors who made visits to the library once or twice a year (as opposed to no visits) were nearly two times more likely to be health literate, whereas weekly or monthly use was not. Because using the Internet or computer to learn was one of the strongest predictors of adequate health literacy in our analysis, it is possible that Internet use may have had some bearing on this finding. In a study examining the influence of the Internet on public library use on adults of all ages, it was found that those who reported using both the Internet and library cited lifestyle (i.e., no need, no time, prefer to buy rather than borrow), problems with access (i.e., inconvenient hours, library too far away), and poor service (i.e., library does not have what I need, poor service, library too focused on kids) as reasons for nonuse of the library (D'Elia, Jorgensen, & Woelfel, 2001).

Interestingly, older adults who volunteered as a fundraiser or who volunteered in "other" activities (e.g., organizing/supervising events, office work, or providing information on behalf of an organization) in the last 12 months were more likely to be health literate. On one hand, learning through social network communication or interaction may reflect yet another mode of lifelong learning by which an individual may develop important literacy skills connected to the understanding and practice of health. On the other hand, older adults with higher levels of education may be more likely to volunteer compared to their less educated counterparts (Turcotte & Schellenberg, 2007). The relationship between civic engagement/connectedness and health literacy requires further research to disentangle these potentially reciprocal associations. It is also unclear why participation in some types of volunteer activities was associated with adequate health literacy, whereas participation in others was not. One possible explanation is that seniors with adequate health literacy prefer to engage in certain types of volunteer activities, in other words there is a reciprocal association. Longitudinal research examining the health literacy skills of older adults before, during, and after participation in volunteer activities would help to clarify these issues.

Our models implicitly assume that enabling factors have a linear and static causal effect on the development of health literacy. Although this is reasonable for some of the enabling factors that occur in earlier life stages such an initial formal education, we cannot be sure that the recurrent learning practices later in life cause the development or maintenance of literacy, or vice versa, whether featuring a higher level of literacy leads to higher engagement in a range of learning-related behaviors. From a theoretical perspective, both directions are likely to be present, where the relationship between literacy and learning practices are likely to be subject to interactive and dynamic effects over the lifespan which are mutually reinforcing (Baker, 2006). From a policy and practice perspective, however, it is clear that to kick-start this mutually reinforcing process, a minimum level of functional literacy is needed, and this can be fostered through reading and comprehension enhancement. Even so, it is important to note that this is not sufficient because literacy practices interact with a wide variety of other personal and contextual factors. The nature of the dataset used for this study does not allow us to disentangle these effects but some recent longitudinal research supports practice engagement theory, namely, that engagement in literacy-related practices has cumulative effects on development (see Reder, 2008).

In terms of need factors, we hypothesized that absence of disease would be predictive of an adequate health literacy in older people. We found that the probability of being health literate was higher among seniors who had not had a disability of 6 months or more (in comparison to those with a current disability of 6 months or more), but not for those who had a problem and then recovered. There are two possible interpretations for our finding. It is possible that older adults who have never had a disability of 6 months or more are in states of health that do not impair health literacy-related skills. Alternatively, it is plausible that an absence of a long-term disability may be the result of possessing higher health literacy skills over the life course.

To date, health literacy studies have largely been based on cross-sectional data, including the present one, suggesting the need for longitudinal research. The collection of qualitative data would also be helpful. At present, little is known about seniors' knowledge about, or attitudes toward, the need for an adequate level of health literacy, especially among various subgroups, such as those disadvantaged by poverty, race, ethnicity, geography, or rural or remote location. Information with respect to why older adults choose to engage, or not engage, in activities that may build or maintain health literacy is also needed. It is also unclear from this study as to the extent to which health

literacy is measuring reading skills or cognitive ability, which requires further study. For instance, Levinthal et al. (2008) have shown that working memory and processing speed account for more variance in health literacy among persons with hypertension than formal education. In addition, the Item Response Theory (IRT) used by the IALSS authors to scale the literacy items into an ordinal scale has many advantages (Murray et al., 1997), but is not the only scaling method that can be used. This study is also limited by the omission of an age variable in the public data tape as well as the absence of data on the health beliefs of respondents—a predisposing characteristic in the Andersen-Newman model (Andersen, 1995).

Given that the majority of predictors for an adequate level of health literacy were enabling in nature, health promotion efforts should be focused on increasing access to, and encouraging the uptake of, these resources. A coordinated approach involving seniors groups, libraries, health promotion agencies, and health care providers to promote computer/Internet learning; foster reading of books, magazines and other health literature; as well as other forms of learning, would encourage lifelong and lifewide health literacy and learning. Given that there are many older adults facing barriers to these approaches, it may also be necessary to examine forms of health information dissemination that allow persons with lower levels of health literacy to gain knowledge.

Appendix

Health Literacy-Related Test Question

"One of the easiest tasks (receiving a difficulty value of 188 and falling in Level 1) directs the reader to look at a medicine label [see Medco Aspirin below] to determine the "maximum number of days you take this medicine." Predictably, this item was also used as one of the contributing stimuli for the Health Literacy domain. In terms of our process variables, type of match was scored as easy because the reader was required to locate a single piece of information that was literally stated in the medicine label. The label contained only one reference to number of days and this information was located under the label dosage. Type of information was scored as easy because it asked for a number of days and plausibility of distracter was judged to be easy because there is no other reference to days in the medicine label." (Statistics Canada, 2003, pp. 20-21)

Appendix (continued)

MEDCO ASPIRIN

500

INDICATIONS: Headaches, muscle pains, rheumatic pains, toothaches, earaches. RELIEVES COMMON COLD SYMPTOMS.

DOSAGE: ORAL. 1 or 2 tablets every 6 hours, preferably accompanied by food, for not longer than 7 days. Store in a cool, dry place.

CAUTION: Do not use for gastritis or peptic ulcer. Do not use if taking anticoagulant drugs. Do not use for serious liver illness or bronchial asthma. If taken in large doses and for an extended period, may cause harm to kidneys. Before using this medication for chicken pox or influenza in children, consult with a doctor about Reyes Syndrome, a rare but serious illness. During lactation and pregnancy, consult with a doctor before using this product, especially in the last trimester of pregnancy. If symptoms persist, or in case of an accidental overdose, consult a doctor. Keep out of reach of children.

INGREDIENTS: Each tablet contains 500 mg acetylsalicicylic acid. Excipient c.b.p. 1 tablet. Reg. No. 88246

Made in Canada by STERLING PRODUCTS, INC. 1600 Industrial Blvd., Montreal, Quebec H9J 3P1

Sample health literacy question from 2003 IALSS Source: Statistics Canada, 2003, p. 21.

Declaration of Conflicting Interests

The author(s) declared that they had no conflicts of interest with respect to their authorship or the publication of this article.

Funding

The author(s) disclosed that they received the following support for their research and/or authorship of this article: This research was funded, in part, by monies awarded to Leslie J. Malloy-Weir by the Social Sciences and Humanities Research Council.

Notes

- 1. Literacy is a necessary requirement for health literacy
- 2. Reading proficiency has been used as a proxy for health-related literacy in the past.
- 3. Public-use Microdata File version
- 4. Please see the *User's Manual, Public-use Microdata File, The international adult literacy and skills survey, 2003* for more detailed sampling information.
- 5. Unweighted estimates
- 6. IRT is a mathematical model for the probability that a particular person will respond correctly to a particular item from a domain of items. This probability is given as a function of a parameter characterizing the proficiency of that person, and two parameters characterizing the properties of that item—difficulty and discrimination. One of the strengths of IRT models is that when their assumptions hold and estimates of the model's item parameters are available for the collections of items that make up the different test forms, all results can be reported directly in terms of IRT proficiency. This property of IRT scaling removes the need to establish the comparability of number-correct score scales for different forms of the test. (Rudd, Kirsch, & Yamamoto, 2004, p. 46)
- Participation in adult education in past 12 months, read manuals/reference books/ journals to learn, use computer or Internet to learn, use video or TV to learn, trying or practicing on own to learn, visit trade fairs or conferences, go on guided tours, learn by watching or getting help, learn by being sent to an organization, attend lectures/seminars/workshops
- 8. Volunteer fundraiser, volunteer board member, volunteer coach/counselor/teacher, volunteer to collect food or goods, "other" volunteer
- 9. Please see pages 165 through 169 of the IALSS *Data User's Manual, Public-use Microdata File, The international adult literacy and skills survey, 2003* for detailed information on the SAS macro.

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