Routledge
Taylor & Francis Group

The Association Between Health Literacy and Cancer-Related Attitudes, Behaviors, and Knowledge

NANCY S. MORRIS

University of Massachusetts Worcester, Graduate School of Nursing, Worcester, Massachusetts, USA

TERRY S. FIELD

University of Massachusetts Medical School, Worcester, Massachusetts, and Meyers Primary Care Institute, Worcester, Massachusetts, USA

JOANN L. WAGNER

Meyers Primary Care Institute, Worcester, Massachusetts, USA

SARAH L. CUTRONA

University of Massachusetts Medical School, Worcester, Massachusetts, and Meyers Primary Care Institute, Worcester, Massachusetts, USA

DOUGLAS W. ROBLIN

Kaiser Permanente, Atlanta, Georgia, USA

BRIDGET GAGLIO

Mid-Atlantic Permanente Research Institute/Kaiser Permanente
Mid-Atlantic States, Rockville, Maryland, USA

ANDREW E. WILLIAMS

Kaiser Permanente, Honolulu, Hawaii, USA

PAUL J. K. HAN

Center for Outcomes Research and Evaluation, Portland, Maine, USA

MARY E. COSTANZA

University of Massachusetts Medical School, Worcester, Massachusetts, USA

KATHLEEN M. MAZOR

University of Massachusetts Medical School, Worcester, Massachusetts,
and Meyers Primary Care Institute, Worcester, Massachusetts, USA

*Using a multidimensional assessment of health literacy (the Cancer Message Literacy Test-Listening, the Cancer Message Literacy Test-Reading, and the Lipkus Numeracy Scale), the authors assessed a stratified random sample of 1013 insured adults (40–70 years of age). The authors explored whether low health literacy across all 3 domains (*n = 111*) was associated with sets of variables likely to affect engagement in cancer prevention and screening activities: (a) attitudes and behaviors relating to health care encounters and providers, (b) attitudes toward cancer and health, (c) knowledge of cancer screening tests, and (d) attitudes toward health related media and actual media use. Adults with low health literacy were more likely to report avoiding doctor's visits, to have more fatalistic attitudes toward cancer, to be less accurate in identifying the purpose of cancer screening tests, and more likely to avoid information about diseases they did not have. Compared with other participants, those with lower health literacy were more likely to say that they would seek information about cancer prevention or screening from a health care professional and less likely to turn to the Internet first for such information. Those with lower health literacy reported reading on fewer days and using the computer on fewer days than did other participants. The authors assessed the association of low health literacy with colorectal cancer screening in an age-appropriate subgroup for which colorectal cancer screening is recommended. In these insured subjects receiving care in integrated health care delivery systems, those with low health literacy were less likely to be up to date on screening for colorectal cancer, but the difference was not statistically significant.*

Health literacy, defined as "the degree to which individuals can obtain, process, understand, and communicate about health-related information needed to make informed health decisions" (Berkman, Davis, & McCormack, 2010) is a complex, multifaceted phenomenon. Reading ability, understanding of spoken information, and numeracy are all aspects of health literacy. Although health literacy has in the past been measured using instruments that assess reading and numeracy, comprehension of spoken information is also important because a great deal of health information is transmitted orally. American adults typically get health information from friends, family, radio, television, and health professionals (Health.gov, 2008) highlighting the value of considering listening as well as reading and numeracy skills for health literacy.

Differences in health literacy may contribute to health disparities (Bennett, Chen, Suroui, & White, 2009; Curtis, Wolf, Weiss, & Grammer, 2012; Osborn, Paasche-Orlow, Davis, & Wolf, 2007), affect health outcomes (Cavanaugh et al., 2008; Murray et al., 2009) and health care costs (Howard, Gazmararian, & Parker, 2005). There is some evidence that adults with lower health literacy are less likely to use preventive services (Dolan et al., 2004; White, Chen, & Atchison, 2008), less likely to undergo cancer screening (Paqan et al., 2012; Peterson, Dwyer, Mulvaney, Dietrich, & Rothman, 2007), and have higher mortality (Baker et al., 2007; Bostock & Steptoe, 2012; Sudore et al., 2006). These important associations suggest a need for further research to better understand the pathways linking low health literacy to these outcomes and to identify the populations most vulnerable to the negative effects of low health literacy. A comprehensive, multidimensional assessment of health literacy that evaluates reading, numeracy and listening skills would provide a strong foundation for such efforts.

Factors that might influence the differences in health outcomes between adults with low and high health literacy deserve further exploration. Health beliefs and attitudes are potentially important factors. For example, cancer fatalism, low self-efficacy, and mistrust of health care providers have all been associated with decreased cancer screening. *Cancer fatalism*, the general belief that outcomes of cancer are determined by fate (Powe & Finnie, 2003), is a potential barrier to cancer prevention (Behbakht, Lynch, Teal, Degeest, & Massad, 2004; Lopez-McKee, McNeil, & Morales, 2008) and has been associated with lower cancer screening (Powe & Finnie, 2003; Power et al., 2008). Low self-efficacy, mistrust of health care providers, and previous negative experiences with the medical system have also been found to be associated with lower rates of cancer screening (Bynum, Davis, Green, & Katz, 2012; Daley et al., 2012; Othman, Kiviemi, Wu, & Lally, 2012) and lower adherence to health care recommendations (Thom, Ribisl, Steward, & Luke, 1999). Health beliefs and attitudes such as these might conceivably mediate or moderate the effects of health literacy on other health outcomes. However, this hypothesis remains to be proven; the relationship between health literacy and these beliefs requires further exploration.

Health information seeking behaviors may also influence the effects of health literacy on health outcomes. These behaviors are known to vary with characteristics that have been found to be associated with health literacy. More highly educated adults are more likely to seek information from a variety of sources including health professionals, newspapers, the Internet, family and friends while adults with less education tend to rely more on family and friends for their health information (Ellis, Mullan, Worsley, & Pai, 2012). Education and race are also associated with health information seeking behavior (Ramanadhan & Viswanath, 2006; Rooks, Wiltshire, Elder, BeLue, & Gary, 2012). Further research is needed to evaluate the relationship between health literacy, health information seeking, and media use.

The purpose of this study was to examine the relationship between health literacy and four sets of variables that are likely to affect engagement in cancer prevention and screening activities: (a) attitudes and behaviors relating to health care encounters and providers, (b) attitudes toward cancer and health, (c) knowledge of cancer screening tests, and (d) attitudes toward health-related media and actual media use.

Method

Setting

This study was conducted within the HMO Cancer Research Network, which consists of the research programs, enrollee populations and databases of 14 HMO members

of the HMO Research Network. The overall goal of the Cancer Research Network is to conduct collaborative research to determine the effectiveness of preventive, curative and supportive interventions for major cancers that span the natural history of those cancers among diverse populations and health systems. The 14 health plans, with nearly 11 million enrollees have a history of collaboration and a dedication to ongoing cancer prevention and research. The Cancer Research Network is funded by the National Cancer Institute. Four Cancer Research Network sites participated in recruiting participants: Kaiser Permanente Georgia, Kaiser Permanente Hawaii, Kaiser Permanente Colorado, and Fallon Community Health Plan in Massachusetts. The study was reviewed and approved by the institutional review boards at each of the sites.

Participants

A stratified random sample of adult health plan members who lived within a reasonable distance to the study session locations was invited to participate. All participants were 40 to 70 years of age at the time of recruitment, and all had been enrolled with one of the participating health plans for at least 5 years. To recruit a diverse sample, at three sites (Fallon Community Health Plan, Kaiser Permanente Georgia, and Kaiser Permanente Hawaii) sampling was stratified by U.S. Census–based estimates of educational level. At Kaiser Permanente Georgia, sampling was further stratified to ensure that African American and White members were invited in equal numbers within each educational strata. At Kaiser Permanente Colorado, only Hispanic adults were recruited. Potential participants were identified using health care system data on race/ethnicity and language preference to identify members who self-identified as Latino and had English as their preferred language. Recruitment methods included direct mailings, telephone follow-up, and offering multiple study session locations. Study staff screened interested participants to confirm ability to communicate in English, adequate corrected hearing and vision, and the absence of physical or psychological limitations that would interfere with participation. Across the four sites, a total of 1,013 individuals participated and are included in the present study. Details of participant recruitment and data collection procedures have been previously described (Mazor, Rogers, et al., 2012).

Measurements

Sociodemographic characteristics included age, educational attainment, current health and language spoken at home. We measured three dimensions of health literacy using three instruments. We used the Cancer Message Literacy Test- Listening (CMLT-Listening) to assess comprehension of spoken health messages (Mazor, Roblin, et al., 2012). It is an approximately 1 hr, 45-item, self-administered instrument taken on a computer. Fifteen spoken messages each followed by 2–4 statements are presented on video; participants respond by indicating whether the meaning of the statement is the same as the original message. The CMLT-Reading was used to assess comprehension of written health messages (Mazor, Roblin, et al., 2012). The CMLT-Reading is an approximate 10-min 21-item, self-administered instrument composed of 6 messages each with 3–4 follow-up questions asking the participant to determine whether a given statement has the same meaning as the original message (Mazor, Roblin, et al., 2012). Initial psychometric analyses and validity studies on these measures have been described (Mazor, Rogers, et al., 2012). Health numeracy was measured using the

Lipkus Numeracy Scale (Lipkus, Samsa, & Rimer, 2001). This is an eight-item scale in which participants are asked to determine risk, percent, and chance based upon the information provided. The responses on all three measures are scored as the total percent correct and can range from 0 (*no correct responses*) to 100 (*all responses correct*).

We also assessed participants' subjective assessment of their reading, listening, and numeracy skills. To assess self-rated ability to understand spoken information and reading ability, participants responded on a 4-point scale ranging from 1 (*strongly agree*) to 4 (*strongly disagree*) to two items developed by the Health Literacy and Cancer Prevention research team: (a) "I have a hard time understanding when people speak quickly" and (b) "I am a good reader." To assess the self-perception of ability to perform select mathematical tasks and their preference for the presentation of numerical information, we administered a slight modification of the eight-item Subjective Numeracy Scale (Fagerlin et al., 2007). On a 4-point scale ranging from 1 (*strongly agree*) to 4 (*strongly disagree*), participants responded to eight statements about comfort with mathematical tasks and preference for obtaining information with words or numerical expressions.

To assess attitudes and behaviors relating to health care encounters and providers, we assessed self-efficacy, tendency to avoid physician visit, enjoyment of doctor visits, and trust in the primary care provider. *Self-efficacy* in obtaining medical information when interacting with a physician was measured by adapting five items (items 2, 3, 5, 7, and 10) from the original 10-item Perceived Efficacy in Patient–Physician Interactions scale (Maly, Frank, Marshall, DiMatteo, & Reuben, 1998). We used an 11-point scale ranging from 0 (*not at all confident*) to 10 (*very confident*).

The tendency to *avoid physician visits* was assessed with one question taken from the Health Information National Trends survey (National Cancer Institute, 2007): "Some people avoid visiting their doctor even when they suspect they should. Would you say this is true for you, or not true for you?" Response options were true and not true.

An item to assess *enjoyment of doctor visits* was developed by the Health Literacy and Cancer Prevention team. Participants were asked to respond to the questions, "In general, I enjoy my doctor visits. Do you strongly agree, agree, disagree, or strongly disagree?"

Trust in the primary care provider was assessed using the following two items from the Trust in the Medical Profession scale (Dugan, Trachtenberg, & Hall, 2005): (a) "I completely trust my doctor's decisions about which medical screenings are best for me" and (b) "All in all I have complete trust in my doctor." Response options ranged on a 5-point scale from *strongly disagree* to *strongly agree*. We used a summary score of the two items (range = 2–10). The higher score equals greater trust.

To understand attitudes toward cancer and health, we assessed cancer fatalism and risk vulnerability. *Cancer fatalism* was assessed with three questions modified from the Health Information National Trends Survey (National Cancer Institute, 2007): (a) "It seems like almost everything causes cancer"; (b) "There's not much people can do to lower their chances of getting cancer"; and (c) "There are so many recommendations about preventing cancer, it's hard to know which ones to follow." Response options for these statements ranged on a 5-point scale from *strongly disagree* to *strongly disagree*.

Risk vulnerability was measured using one item: "I have very little control over risks to my health" (Satterfield, Mertz, & Slovic, 2004). Response options for this statement ranged from 1 (*strongly agree*) to 4 (*strongly disagree*).

Knowledge of common cancer screening tests was assessed by asking participants if they had heard of a colonoscopy, mammogram and Prostate-Specific Antigen Test.

For each screening test, those who responded *yes* were asked what type of cancer the test screened for. These items were developed by the Health Literacy and Cancer Prevention research team.

We also assessed attitudes toward health-related information and actual media use. *Health information seeking* was assessed by asking four questions developed by the Health Literacy and Cancer Prevention research team: (a) "I like to read articles or books about health"; (b) "I like to watch T.V. shows about health"; (c) "I like to learn about new research findings about health"; and (d) "I generally avoid information about diseases or illnesses I don't have." Response options ranged from *strongly agree* to *strongly disagree* on a 4-point scale. In addition, we assessed the sources people relied upon to obtain information about cancer prevention and screening with one modified item from the Health Information National Trends Survey (National Cancer Institute, 2007). Participants were asked, "If you had a question about cancer prevention or screening, how would you find an answer? Where would you look or who would you ask?" Open-ended responses were coded into like categories.

Media use was measured using four items. Participants were asked how many days during the preceding week they (a) read a newspaper, magazine, or book; (b) watched television; (c) listened to the radio; and (d) used a computer. These questions did not refer to health information seeking specifically. The first item was adapted from the Health Information National Trends Survey (National Cancer Institute, 2005) and the remaining items were developed by the Health Literacy and Cancer Prevention research team.

A subset of the group who were of an age for which colorectal cancer screening is recommended, and who did not report any history of colorectal cancer, were linked to complete administrative data on health care utilization at the individual sites. We assessed whether each participant was up to date on colorectal cancer screening on the basis of having an indicator in the administrative data of an Fecal Occult Blood Test/Fecal Immunochemical Test within 2 years or a sigmoidoscopy or colonoscopy within 5 years.

Data Collection

Trained research assistants at each of the sites administered all instruments during an approximate 2-hour in-person session. All instruments and items reported on here were administered orally, except the CMLT-Reading. Participants provided written informed consent and received US$50 for their participation.

Analyses

The purpose of the statistical analysis was to explore associations between low health literacy, and selected health attitudes, beliefs, and health behaviors. Participants were categorized into two groups on the basis of their scores on the three health literacy measures (the CMLT-Listening, the CMLT-Reading, and the Lipkus Numeracy Scale). Those who scored in the lowest quartile on all three instruments were categorized as low health literacy for the purposes of this study. Scores on all three instruments are percent correct scores. For the CMLT-Listening, the lowest quartile scored less than or equal to 68.9 (overall range = 33.4–100.0). For the CMLT-Reading, the lowest quartile scored less than or equal to 76.2 (overall range = 23.8–100.0). For the Lipkus Numeracy Scale the lowest quartile scored less than or equal to 62.5 (overall range = 0.0–100.0). We first describe the characteristics of those who scored in the lowest quartiles on these three measures, and then explore differences between those

with low health literacy and others on (a) attitudes and behaviors relating to health care encounters and providers, (b) attitudes toward cancer and health, (c) knowledge of cancer screening tests, and (d) attitudes toward health-related media and actual media use. We used chi-square tests for categorical variables and *t* tests for continuous variables. All analyses were conducted using IBM SPSS Statistics versions 19.0 and 20.0 (IBM Corp., 2010, 2011). A *p* value less than .05 was considered to indicate a statistically significant difference. All tests were two-tailed.

Results

Among the 1,013 study participants, 111 (10.3%) were classified as *low health literacy*—that is, having a score in the lowest quartile on all three instruments: the CMLT-Listening, CMLT-Reading, and the Lipkus Numeracy Scale (Table 1). Approximately one third of the participants (*n* = 328, or 32.3%) scored in the lowest quartile on one or two of the tests. A total of 574 participants (56.7%) did not score in the lowest quartile on any of the three tests.

Sociodemographic Characteristics

Participants in this study had a mean age of 57.7 years (*SD* = 7.8 years). More than half were female (58.8%) and relatively well educated (73.7% with education beyond high school); the majority were White (49.3%) and rated their health as very good to excellent (54.8%). The participants with low health literacy (111) represented 10.3% of those interviewed. Members of this group were more likely to be female, non-White, have less education, and rate their health as poor to good versus excellent or very good. Participants' subjective reading skills, listening skills, and numeracy were significantly lower in the low health literacy group (*p* < .001).

Attitudes and Behaviors Relating to Health Care Encounters and Providers

Table 2 summarizes participants' attitudes toward patient-provider relationships including self-efficacy in physician–patient encounters, trust in their primary care provider, enjoyment of doctor visits, and avoidance of doctor visits. We found no differences in self-efficacy, trust in physicians, or enjoyment of visits between the two groups, but we found that those with low health literacy were significantly more likely to report a tendency to avoid doctor visits (53.2% vs. 34.6%, *p* < .001).

Attitudes Toward Cancer and Health

Low health literacy participants endorsed more fatalistic views on cancer and cancer prevention (*p* < .01). They also felt less control over risks to their health (*p* < .001; Table 3).

Knowledge of Cancer Screening Tests

Overall, most participants had heard of colonoscopy (92.5%, *n* = 937) and could correctly state that this test screens for colon or colorectal cancer. Similarly, the majority had heard of mammography (97.6%, *n* = 989) and could correctly state that mammography is a screening test for breast cancer. However, 54.5% (*n* = 552) had not heard of or could not correctly identify the cancer being screened for with a prostate specific antigen test (Table 4). Participants with low health literacy were significantly (*p* < .001)

Table 1. Demographic and background characteristics, by health literacy level

Characteristics	Total sample (N = 1,013)		Low health literacy* (n = 111)		All others (n = 902)		p
	%	n	%	n	%	n	
Total sample	100.0	1,013	11.0	111	89.0	902	
Gender							.003
Female	58.8	596	13.3	79	86.7	517	
Male	41.2	417	7.7	32	92.3	385	
Age (years)							.100
40–54	36.0	365	11.5	42	88.5	323	
55–64	42.5	431	8.8	38	91.2	393	
65+	21.4	217	14.3	31	85.7	186	
Race/ethnicity							<.001
Black/African American	13.2	134	26.1	35	73.9	99	
Asian/Native Hawaiian/Pacific Islander	13.9	141	9.9	14	90.1	127	
White/Caucasian	49.3	499	5.4	27	94.6	472	
Hispanic	17.5	177	15.8	28	84.2	149	
Multiple races	4.0	41	4.9	2	95.1	39	
Education							<.001
≤ High school or trade school	26.1	264	24.2	64	75.8	200	
Some college/graduate school	73.7	747	6.3	47	93.7	700	

	M	n	M	n	M	n	
Language							.110
English only	91.0	922	10.5	97	89.5	825	
Other or English and other	9.0	91	15.4	14	84.6	77	
Self-rated health							.003
Good/fair/poor	45.1	457	14.0	64	86.0	393	
Excellent/very good	54.8	555	8.5	47	91.5	508	
Subjective literacy measures							
Subjective reading skill (% strongly agree/agree) "I am a good reader"	86.6	877	77.5	86	87.7	791	.003
Subjective listening skill (% strongly agree/agree) "I have a hard time understanding when people speak quickly"	41.6	421	55.0	61	40.0	360	.002
	M	n	M	n	M	n	
Subjective numeracy skill	2.84	1,013	2.50	111	2.89	902	<.001

Note. CMLT = Cancer Message Literacy Test.
*Low health literacy: Subjects who scored in the lowest quartile on the CMLT-Listening, the CMLT-Reading, and the Lipkus Numeracy Scale.

Table 2. Attitudes and behaviors relating to health care encounters and providers, by health literacy level

Characteristics	Total sample (N = 1,013)		Low health literacy* (n = 111)		All others (n = 902)		p
	M	n	M	n	M	n	
Perceived efficacy in patient–physician interactions	8.14	1,012	8.21	111	8.13	901	.587
Trust in primary care provider	8.35	1,012	8.41	111	8.35	901	.657
	%	n	%	n	%	n	
Avoid physician visits							<.001
True	36.6	371	53.2	59	34.6	312	
Not true	63.3	641	46.8	52	65.4	589	
Enjoy physician visits							.924
Strongly agree/agree	88.7	899	89.2	99	88.9	800	
Disagree/strongly disagree	11.1	112	10.8	12	11.1	100	

Note. CMLT = Cancer Message Literacy Test.
*Low health literacy: Subjects who scored in the lowest quartile on the CMLT-Listening, the CMLT-Reading, and the Lipkus Numeracy Scale.

Table 3. Attitudes toward cancer and health risk, by health literacy level

Item details	Total sample (N = 1,013)		Low health literacy* (n = 111)		All others (n = 902)		p
	%	n	%	n	%	n	
Cancer fatalism							
It seems like almost everything causes cancer.							.003
Strongly agree/agree	37.7	382	50.5	56	36.1	326	
Neutral/disagree/strongly disagree	62.3	631	49.5	55	63.9	576	
There's not much people can do to lower their chances of getting cancer.							<.001
Strongly agree/agree	5.1	52	12.6	14	4.2	38	
Neutral/disagree/strongly disagree	94.9	961	87.4	97	95.8	864	
There are so many recommendations about preventing cancer; it's hard to know which ones to follow.							.001
Strongly agree/agree	57.9	587	72.1	80	56.2	507	
Neutral/disagree/strongly disagree	42.1	426	27.9	31	43.8	395	
Risk vulnerability	%	n	%	n	%	n	
I have very little control over risks to my health.							<.001
Strongly agree/agree	7.1	72	26.1	29	4.8	43	
Disagree/strongly disagree	92.8	940	73.9	82	95.2	858	

Note. CMLT = Cancer Message Literacy Test.
*Low health literacy: Subjects who scored in the lowest quartile on the CMLT-Listening, the CMLT-Reading, and the Lipkus Numeracy Scale.

233

Table 4. Attitudes toward health information and actual media use, by health literacy level

Characteristics	Total sample (N = 1,013)		Low health literacy* (n = 111)		All others (n = 902)		p
	%	n	%	n	%	n	
Like to read about health							.064
Strongly agree/agree	79.8	808	85.6	95	79.0	713	
Disagree/strongly disagree	20.2	205	14.4	16	21.0	189	
Like to watch TV about health							.020
Strongly agree/agree	79.8	808	87.4	97	78.9	711	
Disagree/strongly disagree	20.1	204	12.6	14	21.1	190	
Like to learn new research findings about health							.261
Strongly agree/agree	89.6	908	91.9	102	89.4	806	
Disagree/strongly disagree	10.4	105	8.1	9	10.6	96	
Avoid information about diseases/illnesses I don't have							.017
Strongly agree/agree	22.9	232	31.5	35	21.8	197	
Disagree/strongly disagree	77.1	781	68.5	76	78.2	705	
Where would you turn to find an answer about cancer screening/prevention?							<.001
Doctor/primary care provider/nurse/clinic	69.6	705	86.5	96	67.7	609	
Internet	24.0	243	9.0	10	25.9	233	
Other	6.2	63	4.5	5	6.4	58	
How many days last week did you …	M	n	M	n	M	n	
… read a newspaper, book or magazine?	5.8	1,011	5.3	111	5.9	900	.018
… watch TV	6.1	1,011	6.0	111	6.1	900	.680
… listen to the radio	5.2	1,011	5.0	111	5.2	900	.553
… use a computer	5.4	1,011	4.3	111	5.6	900	<.001

Note. CMLT = Cancer Message Literacy Test.
*Low health literacy: Subjects who scored in the lowest quartile on the CMLT-Listening, the CMLT-Reading, and the Lipkus Numeracy Scale.

Table 5. Knowledge of cancer screening tests, by health literacy level

Characteristics	Total sample (N = 1,013)		Low health literacy* (n = 111)		All others (n = 902)		p
	%	n	%	n	%	n	
Colonoscopy							<.001
Yes (heard of AND knew cancer being screened for)	92.5	937	82.9	92	93.9	845	
No (had not heard of or could not identify cancer being screened for)	7.3	74	17.1	19	6.1	55	
Mammography							<.001
Yes (heard of AND knew cancer being screened for)	97.6	989	92.8	103	98.4	886	
No (had not heard of or could not identify cancer being screened for)	2.2	22	7.2	8	1.6	14	
Prostate-specific antigen test							<.001
Yes (heard of AND knew cancer being screened for)	45.2	458	17.1	19	48.8	439	
No (had not heard of or could not identify cancer being screened for)	54.5	552	82.9	92	51.2	460	

Note. CMLT = Cancer Message Literacy Test.
*Low health literacy: Subjects who scored in the lowest quartile on the CMLT-Listening, the CMLT-Reading, and the Lipkus Numeracy Scale.

less likely to report having heard of a colonoscopy, mammography, or a prostate specific antigen test or to correctly identify the cancer being screened for with each test. This pattern of results was consistent across genders (i.e., when differences were examined for men only, and for women only; data not shown).

Attitudes Toward Health-Related Media and Actual Media Use

Differences in health information seeking between those in the low health literacy group and all others are presented in Table 5. Those with low health literacy liked to watch TV programs about health (87.4% vs. 79.0, $p = .02$) and avoided information about disease/illnesses they did not have (31.5% vs. 21.9, $p = .017$) more than did other participants. Adults with low health literacy were more inclined to seek information about cancer prevention or screening from a health care provider than from other sources ($p = .001$) compared with the others who also sought health information from the Internet, family and friends in addition to a health care provider. Adults with low health literacy reported reading on fewer days (5.3 vs. 5.9, $p = .018$) and using the computer on fewer days (4.3 vs. 5.6, $p < .001$) in the past week than did other participants.

Status of Colorectal Cancer Screening

Among the 1,013 participants, 816 were of an age for which colorectal cancer screening is recommended and reported no personal history of colorectal cancer (86 with low health literacy and 730 without). All were insured and receiving care within integrated health care delivery systems with aggressive screening programs. Adults with low health literacy were somewhat less likely to be up to date with colorectal cancer screening (73.3% vs. 77.3%) but this difference was not statistically significant.

Discussion

The findings reported here suggest an association between low health literacy and sociodemographic factors generally consistent with published research that has used less comprehensive literacy assessments (Kutner, Greenberg, Jin, & Paulsen, 2006; Osborn, Cavanaugh, Wallston, & Rothman, 2010). Health literacy is a multidimensional construct that includes facility with spoken health information, as well written and numerical information. In this study, we used three instruments, each of which assessed performance on one of these facets, to provide a comprehensive assessment of health literacy. This approach enabled us to identify adults who are likely to have the greatest difficulties understanding and using health related information. This multifaceted assessment is consistent with current conceptions of health literacy as a complex construct encompassing multiple related skills influenced by context and culture.

Consistent with findings reported by DeWalt, Boone, and Pignone (2007), we did not find an association between health literacy and self-efficacy or between health literacy and trust in one's primary care provider. Enjoyment of doctor visits also did not differ by literacy level. Our finding of a significant association between low health literacy and avoidance of doctor visits is similar to the previously reported association between low health literacy and less engagement in preventive services (Dolan et al., 2004; White et al., 2008). The reasons people with lower health literacy tend to avoid doctor visits warrants further study. Possible explanations include health

attitudes and beliefs such as cancer fatalism, fear of outcome, lack of understanding regarding value of preventive care, and misunderstanding of existing health care system with use of emergency departments for all health care needs. Other explanations may include access challenges, previous negative experiences with health care interactions, and cost.

In this study, adults with lower health literacy scores were more likely to endorse fatalistic statements about cancer. Powe and Finni (2003) also found higher cancer fatalism among a group with similar demographic characteristics, specifically women, older persons, persons with lower levels of education, the poor, and racial and ethnic minority groups. These results suggest a need for research that determines whether fatalistic beliefs contribute to differences in information seeking, engagement with health care, and/or use of preventative and screening services between individuals with low versus high health literacy.

Perhaps it is not surprising that participants with low health literacy were less familiar with or less likely able to identify the cancer being screened for with a colonoscopy, mammography, or a Prostate-Specific Antigen Test than were adults with higher health literacy. The majority of the participants were familiar with colonoscopy and mammography, likely because of their being insured and receiving care within integrated health care delivery systems with organized cancer screening programs. The differences between low and high health literacy groups may be even more dramatic in other segments of the population. These results have important implications for patient–provider and public health communications. We cannot assume that people with low health literacy understand the name of screening tests or even what was screened for if they have had the test.

In this population, adults with low health literacy were more likely to seek information about cancer prevention and screening from health care providers than from other sources. Given that the subjective and objective measures of numeracy, reading, and listening skills in this population were consistent, the inclination of this group to seek information from an informed professional rather than from family, friends, or the Internet may reflect a realistic self-assessment of their abilities. The reason that adults with low health literacy are less likely to get health information from the Internet is not clear but may be related to access, challenges in navigating the multitude of sources available on the Internet or overall discomfort interfacing with the Internet. That adults with higher health literacy were more likely to seek health information from the Internet as well as their health care provider has been reported previously (Gaglio, Glasgow, & Bull, 2012; Sheih, Mays, McDaniel, & Yu, 2009).

Further study is needed to explore why individuals with low health literacy rely primarily on their health care providers for health information about cancer prevention and screening especially when they report that they avoid visits with their doctor. With the emphasis on public health messages to inform the public about cancer prevention and screening, it is concerning that we may not be reaching the large segment of the population who have low health literacy. Television and radio are used consistently among all participants and may be better avenues for sharing cancer prevention and screening messages than print material or the Internet, which tend to be used less often by adults with low health literacy. Adults with low health literacy also reported avoiding information about diseases they don't have.

We considered a variety of variables in this study, including attitudes, knowledge, and behaviors. Different theories of health behavior emphasize one or more

of these variables. For instance, the theory of planned behavior (Ajzen, 1991) asserts that attitudes, perceived social norms, and perceived behavioral control all influence behavioral intent and behavior. Considered in this theoretical framework, our findings suggest that messages that target fatalistic beliefs and attitudes may be particularly effective in influencing low literacy adults to engage in cancer screening. However, the Integrative Model of Behavioral Prediction (Fishbein & Yzer, 2003) provides a more inclusive framework for considering the numerous variables that may influence health behaviors, with skills (e.g., health literacy) as proximal influences, and media exposure as more distal instances, and attitudes and self-efficacy as intermediate influences. Further study is necessary in order to test the relative importance of these influences and to test the relationships specified in this framework. The relatively high rates of colorectal screening in this sample of members of integrated health care systems which actively encourage screening prevent us from testing these relationships in the present study.

Limitations

This study has limitations. It is important to note that it is a cross-sectional study, and the associations reported here do not imply causal relationships. The study participants were all insured, receiving care within integrated health care delivery systems with organized cancer screening programs, able to speak English, and volunteered to participate in the study, and thus may differ from the general population in ways that could limit the generalizability of the results. In addition, our sample was relatively well-educated, and only 10% of our participants met the criteria we established for low health literacy. These factors may account for some differences in the associations of health literacy with sociodemographic characteristics of participants compared with other studies. We assessed listening skills but not the interaction between a patient and a provider and thus may have missed the reciprocal relationship desired in a patient–provider interaction. Our questions related to media use were restricted to self-report of the preceding week which may not be representative of typical media use throughout the year. Overreporting of media use was found in a previous study assessing frequency of watching major network news programs (Prior, 2009), and thus, our numbers may be higher than actual use. This suggests that the actual use of print material and computers may be even less in the adults with low health literacy highlighting the importance of incorporating listening skills into assessments of health literacy.

Conclusions

In this population of insured adults, we identified differences among adults with low health literacy, using a comprehensive assessment of reading, listening, and numeracy, which may impact their engagement in cancer prevention and screening activities. Compared with others, adults with low health literacy were more likely to avoid physician visits, more fatalistic about cancer, had less familiarity and knowledge about common cancer screening tests, and were less likely to seek health information from sources other than physicians. These findings have important implications for health care interactions and public health communication. Understanding the reasons for these beliefs and behaviors may suggest ways to target and tailor communication for this vulnerable population.

References

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, *50*, 179–211.

Baker, D. W., Wolf, M. S., Feinglass, J., Thompson, J. A., Gazmararian, J. A., & Huang, J. (2007). Health literacy and mortality among elderly persons. *Archives of Internal Medicine*, *167*, 1503–1509. doi: 10.1001/archinte.167.14.1503

Behbakht, K., Lynch, A., Teal, S., Degeest, K., & Massad, S. (2004). Social and cultural barriers to Papanicolaou test screening in an urban population. *Obstetrics & Gynecology*, *104*, 1355–1361. doi: 10.1097/01.AOG.0000143881.53058.81

Bennett, I. M., Chen, J., Soroui, J. S., & White, S. (2009). The contribution of health literacy to disparities in self-rated health status and preventive health behaviors in older adults. *Annals of Family Medicine*, *7*, 204–211. doi: 10.1370/afm.940

Berkman, N. D., Davis, T. C., & McCormack, L. (2010). Health literacy: What is it? *Journal of Health Communication*, *15*(Suppl. 2), 9–19. doi: 10.1080/10810730.2010.499985

Bostock, S., & Steptoe, A. (2012). Association between low functional health literacy and mortality in older adults: Longitudinal cohort study. *British Medical Journal*, *344*, e1602. doi: 10.1136/bmj.e1602

Bynum, S. A., Davis, J. L., Green, B. L., & Katz, R. V. (2012). Unwillingness to participate in colorectal cancer screening: Examining fears, attitudes, and medical mistrust in an ethnically diverse sample of adults 50 years and older. *American Journal of Heath Promotion*, *26*, 295–300. doi: 10.4278/ajhp.110113-QUAN-20

Cavanaugh, K., Huizinga, M. M., Wallston, K. A., Gebretsadik, T., Shintani, A., Davis, D., … Rothman, R. L. (2008). Association of numeracy and diabetes control. *Annals of Internal Medicine*, *148*, 737–746.

Curtis, L. M., Wolf, M. S., Weiss, K. B., & Grammer, L. C. (2012). The impact of health literacy and socioeconomic status on asthma disparities. *Journal of Asthma*, *49*, 278–283. doi: 10.3109/02770903.2011.648297

Daley, C. M., Kraemer-Diaz, A., James, A. S., Monteau, D., Joseph, S., Pacheco, J., … Greiner, K. A. (2012). Breast cancer screening beliefs and behaviors among American Indian women in Kansas and Missouri: A qualitative inquiry. *Journal of Cancer Education*, *27*(Suppl. 1), S32–S40. doi: 10.1007/s13187-012-0334-3

DeWalt, D. A., Boone, R. S., & Pignone, M. P. (2007). Literacy and its relationship with self-efficacy, trust, and partiicpation in medical decision making. *American Journal of Health Behavior*, *31*(Suppl. 1), S27–S35.

Dolan, N. C., Ferreira, M. R., Davis, T. C., Fitzgibbon, M. L., Rademaker, A., Liu, D., … Bennett, C. L. (2004). Colorectal cancer screening knowledge, attitudes, and beliefs among veterans. Does literacy make a difference? *Journal of Clinical Oncology*, *22*, 2617–1622. doi: 10.1200/JCO.2004.10.149

Dugan, E., Trachtenberg, F., & Hall, M. A. (2005). Development of abbreviated measures to assess patient trust in a physician, a health insurer, and the medical profession. *BMC Health Service Research*, *3*, 64. doi: 10.1186/1472-6963-5-64

Ellis, J., Mullan, J., Worsley, A., & Pai, N. (2012). The role of health literacy and social networks in arthritis patients' health information–seeking behavior: A qualitative study. *International Journal of Family Medicine*. doi: 10.1155/2012/3979039

Fagerlin, A., Zikmund-Fisher, B. J.,Ubel, P. A., Jankovic, A., Derry, H. A., & Smith, D. M. (2007). Measuring numeracy without a math test: Development of the Subjective Numeracy Scale. *Medical Decision Making*, *27*, 672–680. doi: 10.1177/0272989X07304449

Fishbein, M., & Yzer, M. C. (2003). Using theory to design effective health behavior interventions. *Communication Theory*, *13*, 164–183. doi: 10.1111/j.1468-2885.2003.tb00287.x

Gaglio, B., Glasgow, R. E., & Bull, S. S. (2012). Do patient preferences for health information vary by health literacy or numeracy? A qualitative assessment. *Journal of Health Information: International Perspectives*, *17*(Suppl. 3), 109–121. doi: 10.1080/10810730.2012.712616

Health.gov. (2008). America's health literacy: Why we need accessible health information. An issue brief from the U.S. Department of Health and Human Services. Retrieved from http://www.health.gov/communication/literacy/issuebrief

Howard, D. H., Gazmararian, J., Parker, R. M. (2005). The impact of low health literacy on the medical costs of Medicare-managed care enrollees. *American Journal of Medicine*, *118*, 371–377. doi: 10.1016/j.amjmed.2005.01.010

IBM Corp. (2010). *IBM SPSS Statistics for Windows*, *Version 19.0*. Armonk, NY: Author.

IBM Corp. (2011). *IBM SPSS Statistics for Windows*, *Version 20.0.* Armonk, NY: Author.

Kutner, M., Greenberg, E., Jin, Y., & Paulsen, C. (2006). *The health literacy of America's adults: Results from the 2003 National Assessment of Adult Literacy (NCES 2006-483)*. Washington, DC: National Center for Education Statistics.

Lipkus, I. M., Samsa, G., & Rimer, B. K. (2001). General performance on a numeracy scale among highly educated samples. *Medical Decision Making*, *21*, 37–44. doi: 10.1177/0272989X0102100105

Lopez-McKee, G., McNeill, J. A., Bader, J., & Morales, P. (2008). Comparison of factors affecting repea mammorgraphy screening of low-income Mexican American women. *Oncology Nursing Forum*, *35*, 941–947. doi: 10.1188/08.ONF.941-947l

Maly, R. C., Frank, J. C., Marshall, G. N., DiMatteo, M. R., & Reuben, D. B. (1998). Perceived Efficacy in Patient–Physician Interactions (PEPPI): Validation of an instrument in older persons. *Journal of the American Geriatric Society*, *46*, 889–894.

Mazor, K. M., Roblin, D. W., Williams, A. E., Greene, S. M., Gagilo, B., Field, T. S., … Cowan, R. (2012). Health literacy and cancer prevention: Two new instruments to assess comprehension. *Patient Education and Counseling*, *88*(1), 54–60. doi: 10.1016/j.pec.2011.12.009

Mazor, K. M., Rogers, H. J., Williams, A. E., Roblin, D. W., Gaglio, B., Field, T. S., … Costanza, M. R. (2012). The Cancer Message Literacy Tests: Psychometric analyses and validity studies. *Patient Education and Counseling*, *89*(1), 69–75. doi: 10.1016/j.pec.2012.06.018

Murray, M. D., Tu, W., Wu, J., Morrow, D., Smith, F., & Brater, D. C. (2009). Factors associated with exacerbation of heart failure include treatment adherence and health literacy skills. *Clinical Pharmacology & Therapeutics*, *85*, 651–658. doi: 10.1038/clpt.2009.7

National Cancer Institute. (2007). *Health Information National Trends Survey (HINTS)*. Retrieved from http://www.hints.cancer.gov

Osborn, C. Y., Cavanauh, K., Wallston, K., & Rothman, R. L. (2010). Self-efficacy links health literacy and numeracy to glycemic control. *Journal of Health Communication*, *15*(Suppl. 2), 146–158. doi: 10.1080/10810730.2010.499980

Osborn, C. Y., Paasche-Orlow, M. K., Davis, T. C., Wolf, M. S. (2007). Health literacy: An overlooked factor in understanding HIV health disparities. *American Journal of Preventive Medicine*, *33*, 374–378. doi: 10.1016/j.amepre.2007.07.022

Othman, A. K., Kiviniemi, M. T., Wu, Y. W., & Lally, R. M. (2012). Influence of demographic factors, knowledge and beliefs on Jordanian women's intention to undergo mammography screening. *Journal of Nursing Scholarship*, *44*(1), 19–26. doi: 10.1111/j.1547-5069.2011.01435.x

Paqan, J. A., Brown, C. J., Asch, D. A., Armstrong, K., Bastida, E., & Guerra, C. (2012). Health literacy and breast cancer screening among Mexican American women in South Texas. *Journal of Cancer Education*, *27*(1), 132–137. doi: 10.1007/s13187-011-0239-6

Peterson, N. B., Dwyer, K. A., Mulvaney, S. A., Dietrich, M. S., & Rothman, R. L. (2007). The influence of health literacy on colorectal cancer screening knowledge, beliefs and behavior. *Journal of the National Medical Association*, *99*, 1105–1112.

Prior, M. (2009). The immensely inflated news audience: Assessing bias in self-reported news exposure. *Public Opinion Quarterly*, *72*(1), 130–143.

Powe, B. D., & Finnie, R. (2003). Cancer fatalism: The state of the science. *Cancer Nursing*, *26*, 454–465.

Power, E., Van Jaarsveld, C. H., McCaffery, K., Miles, A., Atkin, W., & Wardle, J. (2008). Understanding intentions and action in colorectal cancer screening. *Annals of Behavioral Medicine*, *35*, 285–294. doi: 10.1007/s12160-008-9034-y

Ramanadhan, S., & Viswanath, K. (2006). Health and the information nonseeker: A profile. *Health Communication*, *20*, 131–139. doi: 10.1207/s15327027hc2002_4

Rooks, R. N., Wiltshire, J. C., Elder, K., BeLue, R., & Gary, L. C. (2012). Health information seeking and use outside of the medical encounter: Is it associated with race and ethnicity? *Social Science & Medicine*, *74*, 176–184. doi: 10.1016/j.socscimed.2011.09.040

Satterfield, T. A., Mertz, C. K., & Slovic, P. (2004). Discrimination, vulnerability, and justice in the face of risk. *Risk Analysis*, *24*(1), 115–129. doi: 10.1111/j.0272-4332.2004.00416.x

Sheih, C., Mays, R., McDaniel, A., & Yu, J. (2009). Health literacy and its association with the use of information sources and with barriers to information seeking in clinic-based pregnant women. *Health Care for Women International*, *30*, 971–988. doi: 10.1080/07399330903052152

Sudore, R. L., Yaffe, K., Satterfield, S., Harris, T. B., Mehta, K. M., Simonsick, E. M., … Schillinger, D. (2006). Limited literacy and mortality in the elderly: The health, aging, and body composition study. *Journal of General Internal Medicine*, *21*, 806–812. doi: 10.1111/j.1525-1497.2006.00539.x

Thom, D. H., Ribisl, K. M., Stewart, A. L., & Luke, D. A. (1999). Further validation and reliability testing of the trust in physician scale. *Medical Care*, *37*, 510–517.

White, S., Chen, J., & Atchison, R. (2008). Relationship of preventive health practices and health literacy: A national study. *American Journal of Health Behavior*, *32*, 227–242.