

Literacy, Numeracy, and Health Information Seeking among Middle-Aged and Older Adults in the U.S.

By Takashi Yamashita, Ph.D., MPH, MA ¹, Anthony., R. Bardo, Ph.D., MGS ²., and Darren Liu, Dr.PH ³., & Phyllis A. Cummins, Ph.D. ⁴

1. Department of Sociology, Anthropology, and Health Administration and Policy, University of Maryland, Baltimore County, Baltimore, MD, U.S.A

2. Department of Sociology, University of Kentucky, Lexington, KY, U.S.A

3. Department of Public Health, Des Moines University, Des Moines, IA, U.S.A

4. Scripps Gerontology Center, Miami University, Oxford, OH, U.S.A

Abstract

Health literacy is often viewed as an essential skill set for successfully seeking health information to make health-related decisions. However, this general understanding has yet to be established with the use of nationally representative data. The objective of this study was to provide the first nationally representative empirical evidence that links health information seeking behaviors with health literacy among middle-age to older adults in the U.S. Data were obtained from the 2012/2014 Program for International Assessment of Adult Literacy (PIAAC). Our analytic sample is representative of adults age 45 to 74 (n = 2,989). Results showed that distinct components of health literacy (i.e., literacy, and numeracy) were uniquely associated with the use of different health information sources (e.g., health professionals, the internet, television). Findings should be useful for government agencies and health care providers

interested in targeting health communications, as well as researchers who focus on health disparities.

Key words: health behaviors; life course; health literacy

Literacy, Numeracy, and Health Information Seeking among Middle-Aged and Older Adults in the U.S.

The effective use of health information is generally viewed as key for preventing and managing ill-health over the life course. However, health information seeking is a complex process (e.g., identifying specific topics of interest, finding information sources, and evaluating the information quality) (Gaglio, Glasgow, & Bull, 2012). Health literacy—“the degree to which individuals have the capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions”—is an essential skill for successful health information seeking (U.S. Department of Health and Human Services, 2010, p. 1). Yet, the majority of older Americans have insufficient health literacy skills, and this population tends to have difficulty locating and evaluating existing health information provided through a variety of sources (Malone, Jo, & Clifton, 2017; U.S. Department of Health and Human Services, 2008). From a public health standpoint, it is particularly important to ensure the access to, and effective use of, health information in later life when people are more likely to face health risks.

Research on health literacy and health information seeking is only in its infancy. Existing empirical evidence is typically based on data from relatively small samples, limited geographic areas, and qualitative interviews (e.g., Gaglio et al., 2012; Kelley, Su, & Britigan, 2016; Taha, Sharit, & Czaja, 2009; Taha, Sharit, & Czaja, 2014). Moreover, the few studies that have used nationally representative data do not specifically focus on health information seeking among middle-aged to older adults (Bennett, Chen, Soroui, & White, 2009; Chen & Feeley, 2014; Feinberg et al., 2016; Prins & Monnat, 2015; Yamashita, Bardo, Millar, & Liu, 2018). Thus, an examination of older sub-populations who have relatively high needs for health information

should be an urgent research concern. The present study contributes to this emerging body of knowledge by conducting an exploratory analysis of health literacy and health information seeking with the use of a nationally representative sample of adults age 65-74.

Methods

Data

The data were obtained from the 2012/2014 Program for the International Assessment of Adult Competencies (PIAAC) (Ramey et al., 2016). The 2012 PIAAC only targeted those aged 16 to 65 in the U.S., whereas the 2014 PIAAC oversampled adults aged 66-years and older as well as those unemployed in the 45-65 years old age group. The PIAAC2012/2014 data (released to the public in 2016) provide a unique opportunity to examine health literacy and the use of health information sources among a nationally representative sample of older adults. The PIAAC U.S. module adopted the four-stage (i.e., county, census blocks, household and individuals) stratified area sampling method to ensure the representativeness (Hogan et al., 2016). These data include sophisticated measures for literacy and numeracy (described below), as well as detailed information on health information seeking behaviors. In order to broadly capture the second half of adult life, respondents age 45 and older (up to 74 years old) were included in this study. After excluding missing information ($n = 290$, approximately 8.8% of the total sample), the final analytic sample consisted of 2,989 respondents.

Measures

Dependent variables - Health information sources. The use of eight health information sources (i.e., health professionals, internet, television, friends and family, books, newspapers, magazines, and radio) was based on the question “How much information about health issues do you get from...?,” with four response categories that range from “none” to “a lot.” Responses

were dichotomized (i.e., none & a little vs. some, & a lot) based on the distributions of original responses (see Tables 1-4) and the interpretability of results in preliminary analyses.

Independent variables – literacy and numeracy. Given that health information broadly consists of both text and numbers, it is critical to examine both literacy and numeracy (Jensen, King, Davis, & Guntzviller, 2010; Peters, Hibbard, Slovic, & Dieckmann, 2007), which collectively reflect the main components of health literacy (Berkman, Sheridan, Donahue, Halpern, & Crotty, 2011). The PIAAC includes a set of 10 plausible values (i.e. the statistical means of estimated score distributions) based on respondents' performance on the literacy/numeracy tasks (see National Center for Education Statistics, n.d for specific examples). Literacy and numeracy scores are interpreted based on PIAAC determined cut-points, which represent skill levels on a 5-point proficiency scale (i.e., 0 to 4 [Below Level 1; Level 1; Level 2; Level 3; Level 4 & 5]) (OECD, 2012). Higher levels indicate greater proficiency. However, based on preliminary analyses, which showed the strongest relationship with the health information seeking, a 2-point proficiency scale (i.e., low vs. medium & high proficiency [Below Level 1 & Level 1 vs. Level 2 to 5]) was employed in this study.

Covariates. A series of covariates were included based on their use in previous research (Berkman et al., 2011; Chen & Feeley, 2014; Suri, Chang, Majid, & Foo, 2014). A measure for numeracy skill use at home was constructed based on responses to six numeracy-related items (see OECD, 2016). The PIAAC-derived index for this measure was utilized, which ordered numeracy skill use into quintiles plus no use (i.e., 1 to 6; 1 = no/least use; to 6 = greatest use among PIAAC respondents). Health status, due to its skewed distribution, was dichotomized based on its original 5-point scale (i.e., excellent, very good, and good vs. fair and poor). Age was recorded with the use of indicator variables that denote six approximate five-year age groups

(i.e., 45-49, 50-54, 55-59, 60-65, 66-70 and 71-74). A series of dichotomous variables were constructed for gender (1 = female; 0 = male), race (1 = white; 0 = non-white), and educational attainment (1 = college or higher; 0 = less than college).

Analytic approach

A descriptive summary for all variables was generated using the final sampling weight (SPFWT0) and 80 replicate weights (SPFWT1-SPFWT80). SAS macro programs produced by the IDB Analyzer application version 4.0.8 (IEA, 2016) were utilized to incorporate sampling weights and sets of literacy/numeracy plausible values. Binary logistic regression (Hosmer & Lemeshow, 2004) was employed to model use of each health information source as a function of literacy, numeracy, and covariates. Unconditional models with literacy and numeracy were constructed first, and covariates were added to the final model. The sampling and replicate weights were incorporated into all analyses, and statistical significance was evaluated at the $\alpha = 0.05$ level. Analyses were conducted using SAS version 9.4 (SAS Institute Inc., 2002-2012).

Results

Tables 1-4 show the distribution of health information sources by variables of interest. In order to provide a detailed descriptive summary, the original response categories (none, a little, some and a lot) were used. Overall, the most common source that individuals obtain “a lot” of health information from is health professionals (49%), followed by the internet (36%), television (31%), friends and family (21%), books (16%), radio (9%), newspapers (9%), and magazines (9%). Approximately 25-50% of respondents reported that they obtain “some” health information from each of the eight sources, respectively. The least common health information

sources, in terms of reporting use as “none” or “a little” are radio (63%), newspapers (60%), and magazines (53%).

Tables 5 and 6 show results from fully conditional binary logistic regression models that estimated the association between health information sources, literacy, and numeracy. Literacy was positively associated with obtaining information from health professionals and internet. That is, adults with medium to high literacy proficiency were more likely to use health professionals and the internet to obtain health information. Four of the eight health information sources were statistically significantly associated with numeracy skills. Specifically, those with medium to high numeracy proficiency are less likely to use TV, books, newspapers and magazines as sources for health information, net of demographic characteristics, socioeconomic status, health status, and use of numeracy skills at home.

Discussion

A lack of nationally representative findings surrounding the use of health information sources and health literacy in later life is clearly a gap that needed to be addressed. This study analyzed nationally representative data of adults age 45-74 and found that literacy and numeracy are uniquely associated with different health information sources. Literacy was positively associated with use of health professionals and the internet, and numeracy was negatively associated with TV, books, newspapers, and magazines. The positive effects of literacy might reflect the quality of communication with health care providers. Also, given that internet-based health information tends to be text-based, searching for health information online likely requires sufficient literacy skills (Feinberg et al., 2016).

The negative association of numeracy with several health information sources was surprising. Numeracy is essential to accurately comprehend and use numeric health information.

Particularly, precise estimation of health risks and benefits is associated with better health decisions, greater compliance with recommended practices (e.g., medication, preventive health service) and earlier access to necessary medical treatment (Peters et al., 2007; Reyna, Nelson, Han, & Dieckmann, 2009). As such, the negative association of numeracy with specific health information sources might reflect prior successful health information seeking experience (e.g., Chen & Feeley, 2014). In other words, middle-aged and older adults with proficient numeracy may not exhibit extensive and/or repetitive health information seeking behaviors across multiple sources due to their sufficient knowledge, efficiency, and confidence in their abilities to make health decisions.

This study is not without limitations. For example, omitted variable bias cannot be ruled out. Also, literacy and numeracy are not identical to the concept of health literacy. At the same time, literacy and numeracy are sound indicators of health literacy (DeWalt & Pignone, 2005). Despite such limitations, this study makes important contributions to an emerging body of knowledge, including the detailed presentation of nationally representative findings of literacy, numeracy, and other characteristics of middle-aged and older adults by health information sources. Also, we showed that literacy and numeracy have distinctive roles in the context of health information seeking. This information should be useful for health information providers (e.g., health organizations, government agencies and health professionals) interested in improving current health communication practices (e.g., omission of required calculations in health information, use of visual aids) (Peters et al., 2007). Given a lack of prior nationally representative evidence, findings from the present study reflect a foundation from which future research can build. A better understanding of literacy and numeracy is a critical step toward enhancing access to, and utilization of quality health information in later life.

Acknowledgement

The research reported here was partially supported by the Institute of Education Sciences, U.S. Department of Education, through Grant R305A170183 to Miami University and University of Maryland, Baltimore County. The opinions expressed are those of the authors and do not represent views of the institute or the U.S. Department of Education. Additionally, this research was partially funded by the American Institutes for Research through a contract with the National Center for Education Statistics of the U.S. Department of Education.

References

- 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. *The Annals of Family Medicine*, 7(3), 204-211. doi:10.1370/afm.940
- Berkman, N. D., Sheridan, S. L., Donahue, K. E., Halpern, D. J., & Crotty, K. (2011). Low health literacy and health outcomes: An updated systematic review. *Annals of Internal Medicine*, 155(2), 97-107. doi:10.7326/0003-4819-155-2-201107190-00005
- Chen, Y., & Feeley, T. H. (2014). Numeracy, information seeking, and self-efficacy in managing health: an analysis using the 2007 Health Information National Trends Survey (HINTS). *Health Communication*, 29(9), 843-853.
- DeWalt, D. A., & Pignone, M. P. (2005). Reading is fundamental: The relationship between literacy and health. *Archives of Internal Medicine*, 165(17), 1943-1944. doi:10.1001/archinte.165.17.1943
- Feinberg, I., Frijters, J., Johnson-Lawrence, V., Greenberg, D., Nightingale, E., & Moodie, C. (2016). Examining associations between health information seeking behavior and adult

- education status in the US: An analysis of the 2012 PIAAC Data. *PloS one*, 11(2), 1-20.
doi:10.1371/journal.pone.0148751
- 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 Communication*, 17(sup3), 109-121. doi:10.1080/10810730.2012.712616
- Hogan, J., Thornton, N., Diaz-Hoffmann, L., Mohadjer, L., Krenzke, T., Li, J., . . . Khorramdel, L. (2016). *U.S. Program for the International Assessment of Adult Competencies (PIAAC) 2012/2014: Main Study and National Supplement Technical Report*. Retrieved from Washington, DC: https://nces.ed.gov/pubs2016/2016036_rev.pdf
- Hosmer, D. W., & Lemeshow, S. (2004). *Applied logistic regression*: Wiley-Interscience.
- IEA. (2016). Help manual for the IDB analyzer (SAS macros). . Hamburg, Germany. Retrieved from <http://www.iea.nl/data>
- Jensen, J. D., King, A. J., Davis, L. A., & Guntzviller, L. M. (2010). Utilization of internet technology by low-income adults: the role of health literacy, health numeracy, and computer assistance. *Journal of aging and health*, 22(6), 804-826.
- Kelley, M. S., Su, D., & Britigan, D. H. (2016). Disparities in Health Information Access: Results of a County-Wide Survey and Implications for Health Communication. *Health Communication*, 31(5), 575-582. doi:10.1080/10410236.2014.979976
- Malone, T., Jo, P., & Clifton, S. (2017). Perceived eHealth Literacy and Information Behavior of Older Adults Enrolled in a Health Information Outreach Program. *Journal of Consumer Health on the Internet*, 21(2), 137-147.
- National Center for Education Statistics. (n.d). What does the cognitive assessment of PIAAC measure? Retrieved from <https://nces.ed.gov/surveys/piaac/measure.asp>

- OECD. (2012). *Literacy, numeracy and problem solving in technology-rich environments: Framework for the OECD Survey of Adult Skills*. Retrieved from http://www.oecd.org/skills/piaac/PIAAC%20Framework%202012-%20Revised%2028oct2013_ebook.pdf
- Peters, E., Hibbard, J., Slovic, P., & Dieckmann, N. (2007). Numeracy Skill And The Communication, Comprehension, And Use Of Risk-Benefit Information. *Health Affairs*, 26(3), 741-748. doi:10.1377/hlthaff.26.3.741
- Prins, E., & Monnat, S. (2015). Examining associations between self-rated health and proficiency in literacy and numeracy among immigrants and US-born adults: Evidence from the Program for the International Assessment of Adult Competencies (PIAAC). *PloS one*, 10(7), e0130257.
- Rampey, B. D., Finnegan, R., Goodman, M., Mohadjer, L., Krenzke, T., Hogan, J., & Provasnik, S. (2016). *Skills of U.S. Unemployed, Young, and Older Adults in Sharper Focus: Results From the Program for the International Assessment of Adult Competencies (PIAAC) 2012/2014: First Look*. Retrieved from Washington, DC: <https://nces.ed.gov/pubs2016/2016039.pdf>
- Reyna, V. F., Nelson, W. L., Han, P. K., & Dieckmann, N. F. (2009). How numeracy influences risk comprehension and medical decision making. *Psychological Bulletin*, 135(6), 943-973. doi:10.1037/a0017327
- SAS Institute Inc. (2002-2012). SAS (Version 9.4). Cary, NC.
- Suri, V. R., Chang, Y.-K., Majid, S., & Foo, S. (2014). *Health Information Literacy of Senior Citizens – A Review*, Cham.

- Taha, J., Sharit, J., & Czaja, S. (2009). Use of and Satisfaction With Sources of Health Information Among Older Internet Users and Nonusers. *The Gerontologist*, 49(5), 663-673. doi:10.1093/geront/gnp058
- Taha, J., Sharit, J., & Czaja, S. J. (2014). The impact of numeracy ability and technology skills on older adults' performance of health management tasks using a patient portal. *Journal of applied gerontology*, 33(4), 416-436.
- U.S. Department of Health and Human Services. (2008). *America's health literacy: why we need accessible health information* Retrieved from <https://health.gov/communication/literacy/issuebrief/>
- U.S. Department of Health and Human Services. (2010). *National Action Plan to Improve Health Literacy*. Retrieved from Washington, DC:
- Yamashita, T., Bardo, A. R., Millar, R. J., & Liu, D. (2018). Numeracy and Preventive Health Care Service Utilization among Middle-Aged and Older Adults in the U.S. *Clinical Gerontologist*, 1-12. doi:10.1080/07317115.2018.1468378

Table 1: Descriptive Summary by the Health Information Sources (Health Professionals and Internet) for the Adults Aged 45-74

Full Sample N = 3200	Health Professionals				Internet			
	None n = 170 Percentages 5.11%	A Little n = 368 Percentages 11.57%	Some n = 1,089 Percentages 34.68%	A Lot n = 1573 Percentages 48.64%	None n = 767 Percentages 23.06%	A Little n = 376 Percentages 12.22%	Some n = 910 Percentages 29.11%	A Lot n = 1,147 Percentages 35.61%
Variables								
Age group								
Age 45-49	5.44%	15.44%	35.10%	44.03%	16.62%	10.72%	30.84%	41.82%
Age 50-54	5.90%	12.60%	36.22%	45.27%	17.88%	11.19%	31.75%	39.18%
Age 55-59	7.42%	11.54%	36.74%	44.30%	24.12%	10.96%	28.03%	36.88%
Age 60-65	2.73%	9.45%	34.24%	53.59%	23.42%	15.59%	27.48%	33.51%
Age 66-70	5.07%	7.70%	31.04%	56.19%	29.89%	12.08%	28.26%	29.77%
Age 71plus	2.33%	9.99%	30.73%	56.95%	42.76%	13.63%	25.03%	18.58%
Sex								
Female	4.12%	10.86%	34.48%	50.55%	21.49%	10.92%	28.46%	39.13%
Male	6.22%	12.37%	34.92%	46.49%	24.83%	13.68%	29.85%	31.63%
Race								
White	4.39%	11.35%	35.96%	48.30%	19.34%	13.24%	31.70%	35.72%
Non-White	7.11%	12.09%	30.93%	49.86%	33.31%	9.58%	22.05%	35.06%
Education								
College	1.35%	10.40%	36.94%	51.30%	5.52%	11.47%	35.48%	47.52%
< College	7.37%	12.28%	33.36%	46.99%	33.53%	12.68%	25.31%	28.48%
Employment status								
Employed	4.83%	12.44%	37.02%	45.71%	16.61%	12.63%	32.20%	38.57%
Not employed	5.61%	10.03%	30.56%	53.81%	34.47%	11.50%	23.65%	30.38%
Self-rated health								
Good or better	4.60%	12.25%	36.94%	46.20%	16.48%	13.35%	32.21%	37.96%
Fair or poor	6.83%	9.19%	26.49%	57.49%	46.44%	8.26%	18.17%	27.14%
Literacy skill level								
Below 1	22.93%	7.09%	4.79%	6.20%	19.89%	3.15%	2.11%	3.05%
Level 1	23.61%	19.09%	14.60%	16.55%	31.46%	15.62%	11.51%	11.26%
Level 2	35.36%	29.84%	33.88%	34.71%	36.64%	36.23%	34.31%	30.97%
Level 3	15.34%	35.33%	34.21%	33.18%	11.50%	33.49%	39.75%	40.88%
Level 4& 5	2.76%	8.65%	12.52%	9.36%	0.51%	11.50%	12.31%	13.84%
Numeracy skill level								
Below 1	10.52%	11.02%	30.21%	48.52%	60.52%	7.44%	13.40%	18.64%
Level 1	6.28%	10.80%	31.88%	51.04%	37.32%	10.42%	22.82%	29.44%
Level 2	5.47%	10.67%	33.40%	50.45%	20.54%	12.84%	29.37%	37.26%
Level 3	2.87%	12.90%	37.10%	47.13%	6.24%	12.58%	36.70%	44.48%
Level 4& 5	1.69%	13.48%	39.18%	45.66%	0.97%	14.72%	37.33%	46.98%
Numeracy skill use at home								
None	19.55%	12.67%	26.31%	41.48%	70.43%	10.84%	11.30%	7.43%
Lowest to 20%	8.90%	16.34%	29.49%	45.26%	42.80%	13.31%	20.80%	23.09%
21% to 40%	4.90%	11.06%	38.23%	45.81%	26.73%	12.21%	29.89%	31.17%
41% to 60%	3.19%	10.18%	38.09%	48.54%	17.23%	14.78%	31.01%	36.97%
61% to 80%	2.48%	9.49%	35.08%	52.95%	11.76%	12.19%	33.55%	42.51%
> 80%	2.05%	12.17%	34.48%	51.31%	6.05%	8.95%	34.25%	50.75%

The percentages are weighted using the sampling and replicate weights

n shows the unweighted sample sizes

For each variable, the sample size may be slightly different as each variable has a different number of missing values

Table 2: Descriptive Summary by the Health Information Sources (Television, and Friends and Family) for the Adults Aged 45-74

Full Sample N = 3200	None n = 323 Percentages 10.06%	A Little n = 637 Percentages 20.41%	Television		None n = 266 Percentages 7.43%	Friends and Family		
			Some n = 1,239 Percentages 38.79%	A Lot n = 1001 Percentages 30.73%		A Little n = 797 Percentages 24.55%	Some n = 1,475 Percentages 46.95%	A Lot n = 662 Percentages 21.07%
Variables								
Age group								
Age 45-49	10.66%	20.19%	39.13%	30.02%	5.57%	22.87%	50.63%	20.94%
Age 50-54	10.68%	21.46%	37.47%	30.38%	6.14%	25.85%	44.84%	23.17%
Age 55-59	9.85%	23.96%	35.43%	30.76%	7.60%	24.71%	45.12%	22.57%
Age 60-65	8.36%	19.41%	41.10%	31.14%	5.88%	26.81%	47.23%	20.09%
Age 66-70	9.67%	17.09%	43.42%	29.82%	10.83%	24.26%	47.43%	17.47%
Age 71plus	12.76%	16.85%	35.93%	34.46%	15.26%	18.78%	45.76%	20.19%
Sex								
Female	9.54%	19.26%	39.03%	32.17%	6.65%	23.37%	47.87%	22.11%
Male	10.65%	21.71%	38.52%	29.12%	8.31%	25.88%	45.91%	19.90%
Race								
White	11.00%	22.24%	40.64%	26.12%	7.34%	25.05%	47.17%	20.44%
Non-White	7.52%	15.26%	33.79%	43.42%	7.67%	23.22%	46.67%	22.45%
Education								
College	12.07%	26.45%	39.40%	22.08%	4.44%	25.02%	50.71%	19.83%
< College	8.86%	16.80%	38.36%	35.97%	9.23%	24.30%	44.70%	21.78%
Employment status								
Employed	10.39%	22.29%	40.56%	26.75%	5.74%	23.80%	48.85%	21.61%
Not employed	9.48%	17.09%	35.58%	37.86%	10.43%	25.91%	43.62%	20.03%
Self-rated health								
Good or better	9.30%	21.29%	40.86%	28.55%	5.58%	24.22%	49.56%	20.64%
Fair or poor	12.81%	17.18%	31.65%	38.37%	13.90%	25.72%	37.69%	22.69%
Literacy skill level								
Below 1	8.11%	5.64%	3.85%	10.46%	17.23%	5.78%	4.87%	8.00%
Level 1	13.35%	11.51%	13.47%	24.75%	23.17%	14.24%	15.19%	19.82%
Level 2	30.53%	25.21%	37.61%	36.24%	32.62%	33.56%	33.87%	34.79%
Level 3	33.62%	39.51%	35.55%	24.84%	21.69%	34.86%	35.64%	28.33%
Level 4& 5	14.39%	18.13%	9.52%	3.88%	5.28%	11.56%	10.43%	9.06%
Numeracy skill level								
Below 1	10.77%	13.86%	27.67%	47.70%	17.71%	20.12%	36.11%	26.05%
Level 1	9.03%	12.46%	36.62%	41.89%	9.30%	22.41%	45.16%	23.13%
Level 2	8.87%	18.54%	41.83%	30.75%	7.16%	24.69%	47.70%	20.45%
Level 3	10.84%	26.94%	41.97%	20.25%	5.92%	28.00%	48.69%	17.39%
Level 4 & 5	15.21%	34.67%	37.57%	12.55%	3.98%	30.61%	48.51%	16.89%
Numeracy skill use at home								
None	15.48%	19.05%	32.46%	33.02%	19.02%	20.40%	35.73%	24.85%
Lowest to 20%	10.18%	17.19%	32.93%	39.70%	10.55%	25.60%	40.40%	23.45%
21% to 40%	11.50%	17.87%	37.94%	32.69%	8.31%	25.53%	49.23%	16.93%
41% to 60%	8.55%	16.96%	43.64%	30.86%	4.66%	25.07%	50.04%	20.22%
61% to 80%	8.72%	23.80%	41.32%	26.16%	6.07%	25.36%	47.11%	21.46%
> 80%	9.95%	25.45%	37.89%	26.71%	4.30%	22.78%	50.93%	21.99%

The percentages are weighted using the sampling and replicate weights

n shows the unweighted sample sizes

For each variable, the sample size may be slightly different as each variable has a different number of missing values

Table 3: Descriptive Summary by the Health Information Sources (Books and Newspapers) for the Adults Aged 45-74

Full Sample N = 3200	None n = 606 Percentages 19.01%	A Little n = 812 Percentages 25.96%	Books		None n = 1,015 Percentages 31.54%	A Little n = 920 Percentages 28.38%	Newspapers	
			Some n = 1,282 Percentages 39.48%	A Lot n = 500 Percentages 15.55%			Some n = 979 Percentages 30.88%	A Lot n = 286 Percentages 9.21%
Variables								
Age group								
Age 45-49	22.00%	29.24%	33.86%	14.89%	34.99%	29.44%	26.45%	9.12%
Age 50-54	19.91%	26.30%	38.42%	15.38%	30.12%	30.18%	30.43%	9.26%
Age 55-59	19.78%	26.41%	38.44%	15.37%	31.26%	28.73%	30.86%	9.15%
Age 6-065	12.90%	24.64%	44.52%	17.93%	28.24%	27.62%	34.47%	9.67%
Age 66-70	21.33%	24.11%	40.98%	13.58%	35.14%	25.98%	30.96%	7.91%
Age 71plus	19.17%	20.95%	44.94%	14.95%	29.61%	25.10%	34.86%	10.43%
Sex								
Female	14.51%	22.47%	43.03%	19.99%	30.83%	26.63%	32.35%	10.19%
Male	24.08%	29.90%	35.48%	10.54%	32.33%	30.36%	29.22%	8.10%
Race								
White	17.69%	28.31%	39.92%	14.08%	31.16%	30.80%	30.09%	7.95%
Non-White	22.70%	19.60%	38.12%	19.59%	32.77%	22.08%	32.57%	12.58%
Education								
College	8.87%	27.08%	45.55%	18.50%	24.21%	31.90%	34.27%	9.62%
< College	25.06%	25.28%	35.86%	13.79%	35.87%	26.29%	28.87%	8.96%
Employment status								
Employed	17.16%	26.47%	40.52%	15.85%	28.94%	29.72%	31.66%	9.68%
Not employed	22.21%	25.08%	37.67%	15.04%	36.08%	26.03%	29.52%	8.36%
Self-rated health								
Good or better	16.42%	26.61%	41.80%	15.17%	28.30%	29.14%	33.41%	9.15%
Fair or poor	28.25%	23.79%	31.33%	16.63%	42.78%	25.69%	22.08%	9.44%
Literacy skill level								
Below 1	17.03%	4.14%	3.70%	5.79%	9.83%	4.29%	5.22%	8.05%
Level 1	23.80%	12.61%	15.54%	16.68%	18.12%	13.13%	16.39%	21.98%
Level 2	32.76%	32.50%	34.92%	35.01%	32.59%	34.34%	35.33%	32.17%
Level 3	21.13%	38.09%	34.73%	33.80%	29.55%	36.48%	33.66%	30.49%
Level 4& 5	5.28%	12.66%	11.12%	8.72%	9.92%	11.75%	9.39%	7.31%
Numeracy skill level								
Below 1	39.09%	16.95%	28.76%	15.20%	42.29%	19.60%	28.13%	9.98%
Level 1	23.16%	19.83%	39.48%	17.53%	33.89%	23.93%	31.86%	10.31%
Level 2	15.63%	25.78%	42.45%	17.53%	30.41%	30.41%	30.50%	8.68%
Level 3	13.05%	29.80%	42.49%	14.65%	28.30%	32.56%	31.17%	7.98%
Level 4& 5	9.49%	38.54%	40.51%	11.46%	26.11%	37.37%	29.08%	7.44%
Numeracy skill use at home								
None	59.82%	17.45%	19.85%	2.88%	54.24%	19.42%	17.21%	9.13%
Lowest to 20%	33.36%	23.70%	30.81%	12.13%	40.92%	27.04%	24.19%	7.86%
21% to 40%	19.57%	29.52%	36.54%	14.36%	30.11%	28.25%	33.19%	8.46%
41% to 60%	12.82%	26.67%	47.86%	12.65%	27.62%	31.93%	32.02%	8.42%
61% to 80%	9.29%	27.48%	43.92%	19.30%	27.99%	26.78%	34.73%	10.50%
> 80%	10.37%	25.01%	41.63%	22.99%	25.25%	31.38%	33.19%	10.19%

The percentages are weighted using the sampling and replicate weights

n shows the unweighted sample sizes

For each variable, the sample size may be slightly different as each variable has a different number of missing values

Table 4: Descriptive Summary by the Health Information Sources (Magazines and Radio) for the Adults Aged 45-74

Full Sample N = 3200	None	A Little	Magazines Some	A Lot	None	A Little	Radio Some	A Lot
	n = 769 Percentages 23.63%	n = 933 Percentages 29.47%	n = 1,199 Percentages 37.76%	n = 299 Percentages 9.14%	n = 1,132 Percentages 34.44%	n = 888 Percentages 28.58%	n = 883 Percentages 27.64%	n = 297 Percentages 9.34%
Variables								
Age group								
Age 45-49	26.60%	30.90%	32.16%	10.34%	29.89%	31.56%	27.13%	11.42%
Age 50-54	22.28%	31.15%	37.63%	8.93%	29.31%	32.59%	28.54%	9.56%
Age 55-59	21.43%	29.34%	41.29%	7.93%	33.02%	28.39%	29.52%	9.07%
Age 60-65	21.75%	27.53%	39.82%	10.90%	36.98%	25.22%	27.88%	9.92%
Age 66-70	26.81%	29.95%	37.08%	6.16%	43.08%	25.77%	25.38%	5.77%
Age 71plus	24.89%	25.07%	40.36%	9.68%	45.18%	22.66%	24.38%	7.78%
Sex								
Female	19.45%	27.34%	41.89%	11.32%	35.91%	29.33%	26.39%	8.37%
Male	28.34%	31.86%	33.10%	6.70%	32.78%	27.75%	29.04%	10.43%
Race								
White	22.72%	32.19%	37.51%	7.58%	36.56%	30.06%	25.92%	7.46%
Non-White	26.09%	22.15%	38.41%	13.35%	28.78%	24.60%	32.10%	14.51%
Education								
College	13.23%	34.74%	42.14%	9.90%	29.03%	33.55%	29.80%	7.62%
< College	29.81%	26.33%	35.17%	8.70%	37.73%	25.62%	26.37%	10.28%
Employment status								
Employed	20.93%	30.34%	38.94%	9.79%	29.91%	30.62%	29.56%	9.91%
Not employed	28.35%	27.94%	35.70%	8.00%	42.54%	24.99%	24.25%	8.22%
Self-rated health								
Good or better	19.65%	31.22%	39.68%	9.46%	31.85%	29.70%	29.45%	9.00%
Fair or poor	37.48%	23.41%	31.03%	8.07%	43.51%	24.68%	21.23%	10.58%
Literacy skill level								
Below 1	13.82%	4.20%	4.03%	7.10%	7.88%	5.69%	4.65%	11.22%
Level 1	22.23%	12.57%	14.77%	21.75%	16.44%	12.40%	18.05%	24.92%
Level 2	33.79%	32.27%	35.14%	34.28%	34.36%	29.54%	37.80%	33.94%
Level 3	24.12%	37.40%	35.96%	28.15%	30.76%	39.78%	31.13%	24.69%
Level 4 & 5	6.04%	13.56%	10.10%	8.72%	10.56%	12.59%	8.37%	5.23%
Numeracy skill level								
Below 1	41.96%	19.71%	28.21%	10.11%	39.12%	21.90%	23.18%	15.80%
Level 1	29.06%	22.78%	36.59%	11.58%	37.69%	20.31%	30.54%	11.46%
Level 2	21.75%	29.23%	39.91%	9.12%	35.05%	26.84%	29.66%	8.44%
Level 3	16.70%	35.26%	39.78%	8.26%	32.92%	35.56%	24.46%	7.07%
Level 4 & 5	15.61%	42.52%	35.92%	5.95%	32.10%	37.85%	26.23%	3.82%
Numeracy skill use at home								
None	55.81%	21.27%	14.25%	8.67%	43.45%	21.30%	21.48%	13.77%
Lowest to 20%	38.59%	27.46%	29.42%	4.54%	40.15%	24.91%	23.61%	11.34%
21% to 40%	23.76%	28.18%	39.62%	8.44%	36.02%	25.78%	29.59%	8.61%
41% to 60%	19.31%	31.42%	39.83%	9.45%	35.69%	31.17%	25.30%	7.84%
61% to 80%	16.10%	30.22%	43.10%	10.58%	33.12%	29.44%	28.68%	8.76%
> 80%	13.29%	32.43%	42.82%	11.46%	24.85%	33.11%	32.93%	9.11%

The percentages are weighted using the sampling and replicate weights

n shows the unweighted sample sizes

For each variable, the sample size may be slightly different as each variable has a different number of missing values

Table 5: Health Information Sources (health professional, internet, TV and family & friends): Estimated Odds Ratios from Binary Logistic Regression Models

Outcome variable	Health professional	Internet	TV	Friends & family
	OR (SE) [95% CI LL, UL]	OR (SE) [95% CI LL, UL]	OR (SE) [95% CI LL, UL]	OR (SE) [95% CI LL, UL]
Numeracy Level (low vs. medium & high proficiency)	0.81 (0.19) [0.43, 1.19]	1.20 (0.19) [0.82, 1.57]	0.61 (0.12)* [0.38, 0.84]	0.90 (0.16) [0.58, 1.22]
Literacy Level (low vs. medium & high proficiency)	1.72 (0.42)* [0.90, 2.54]	1.94 (0.34)* [1.27, 2.61]	1.25 (0.23) [0.80, 1.71]	1.04 (0.20) [0.64, 1.44]
Age group (45-49, 50-54, 55-59, 60-65, 66-70, 71 plus)	1.19 (0.05)* [1.10, 1.28]	0.83 (0.03)* [0.77, 0.90]	1.03 (0.03) [0.97, 1.09]	0.98 (0.02) [0.94, 1.03]
Female (vs. Male)	1.28 (0.13)* [1.04, 1.53]	1.53 (0.16)* [1.21, 1.85]	1.13 (0.10) [0.93, 1.32]	1.24 (0.10)* [1.01, 1.47]
White (vs. Non-White)	0.97 (0.14) [0.70, 1.24]	0.96 (0.14) [0.69, 1.23]	0.66 (0.09)* [0.48, 0.85]	0.90 (0.10) [0.71, 1.09]
College (vs. < College)	1.53 (0.19)* [1.15, 1.91]	2.27 (0.31)* [1.65, 2.88]	0.58 (0.05)* [0.48, 0.69]	1.06 (0.15) [0.86, 1.25]
Employed (vs. Not employed)	1.06 (0.14) [0.78, 1.31]	1.26 (0.14)* [0.98, 1.54]	0.85 (0.08) [0.69, 1.00]	1.25 (0.15) [0.96, 1.54]
Good or better self-rated health (vs. Fair or poor health)	0.69 (0.08)* [0.53, 0.86]	1.58 (0.17)* [1.25, 1.92]	1.30 (0.17)* [0.97, 1.63]	1.39 (0.14)* [1.11, 1.68]
Numeracy skill use at home (1-6)	1.22 (0.05)* [1.12, 1.19]	1.49 (0.06)* [1.36, 1.61]	1.05 (0.04) [0.98, 1.12]	1.09 (0.03)* [1.03, 1.15]

*indicates the statistically significant association with the health information source, $p < 0.05$

The model predicted the probability of using the health information source – some or a lot

OR = Odds ratio; SE = Standard error; CL = Confidence interval; LL = Lower limit; UL = Upper limit

The PIAAC final sampling weights and replicate weights were applied.

Table 6: Health Information Source (book, newspaper, magazine and radio): Estimated Odds Ratios from Binary Logistic Regression Models

Outcome variable	Book	Newspaper	Magazine	Radio
	OR (SE) [95% CI LL, UL]	OR (SE) [95% CI LL, UL]	OR (SE) [95% CI LL, UL]	OR (SE) [95% CI LL, UL]
Numeracy Level (low vs. medium & high proficiency)	0.71 (0.12)* [0.48, 0.94]	0.69 (0.12)* [0.45, 0.92]	0.70 (0.11)* [0.49, 0.91]	0.71 (0.13) [0.45, 0.98]
Literacy Level (low vs. medium & high proficiency)	1.38 (0.23) [0.93, 1.84]	1.03 (0.18) [0.67, 1.38]	1.35 (0.21) [0.94, 1.76]	0.97 (0.17) [0.63, 1.30]
Age group (45-49, 50-54, 55-59, 60-65, 66-70, 71 plus)	1.19 (0.03)* [1.12, 1.25]	1.12 (0.04)* [1.04, 1.20]	1.11 (0.03)* [1.05, 1.18]	0.99 (0.03) [0.94, 1.04]
Female (vs. Male)	2.17 (0.18)* [1.81, 2.53]	1.26 (0.10)* [1.06, 1.45]	1.82 (0.17)* [1.49, 2.16]	0.82 (0.07)* [0.69, 0.94]
White (vs. Non-White)	0.66 (0.07)* [0.52, 0.81]	0.71 (0.08)* [0.56, 0.87]	0.64 (0.07)* [0.51, 0.77]	0.61 (0.06)* [0.49, 0.72]
College (vs. < College)	1.45 (0.13)* [1.20, 1.70]	1.18 (0.10) [0.98, 1.38]	1.12 (0.10) [0.92, 1.33]	1.04 (0.10) [0.84, 1.23]
Employed (vs. Not employed)	1.37 (0.13)* [1.11, 1.63]	1.24 (0.10)* [1.05, 1.44]	1.36 (0.13)* [1.11, 1.61]	1.31 (0.11)* [1.08, 1.53]
Good or better self-rated health (vs. Fair or poor health)	1.14 (0.12) [0.91, 1.38]	1.58 (0.17)* [1.25, 1.91]	1.31 (0.16)* [1.00, 1.61]	1.34 (0.0.18)* [0.99, 1.68]
Numeracy skill use at home (1-6)	1.35 (0.04)* [1.27, 1.42]	1.17 (0.04)* [1.09, 1.25]	0.70 (0.05)* [1.19, 1.37]	1.09 (0.03)* [1.02, 1.15]

*indicates the statistically significant association with the health information source, $p < 0.05$

The model predicted the probability of using the health information source – some or a lot

OR = Odds ratio; SE = Standard error; CL = Confidence interval; LL = Lower limit; UL = Upper limit

The PIAAC final sampling weights and replicate weights were applied.