Rowlands G, Protheroe J, Winkley J, Richardson M, Seed PT, Rudd R.

A mismatch between population health literacy and the complexity of health information: an observational study.

British Journal of General Practice 2015, 65(635), e351-e356.

DOI link to article:

https://doi.org/10.3399/bjgp15X685285

Date deposited:

12/01/2018

Embargo release date:

25 June 2016

Defining the mismatch between population health literacy and health system complexity, an observational study

Gillian Rowlands, *Clinical Senior Lecturer*[1], Joanne Protheroe, *Senior Lecturer in General Practice*[2], John Winkley, *Director*[3], Marty Richardson, *Statistician*[4], Paul T Seed, *Senior Lecturer in Medical Statistics*[5], Rima E. Rudd, *Senior Lecturer on Health Literacy, Education, and Policy*[6].

Author affiliations

[1] Department of Primary Care & Public Health Sciences , School of Medicine King's College London, 9th Floor, Capital House, 42 Weston Street London SE1 3QD, UK

[2] Research Institute for Primary Health Care & Health Sciences, Keele University, Keele, Staffs, UK

[3] AlphaPlus Consultancy Ltd, Manchester, UK

[4] Liverpool Reviews and Implementation Group, University of Liverpool, Waterhouse Building, Liverpool, UK

[5] Division of Women's Health, King's College London, London, UK

[6] Harvard School of Public Health, Department of Social and Behavioral Sciences, Boston MA, USA

Guarantor: Gillian Rowlands

Correspondence to: Gillian Rowlands gill.rowlands@newcastle.ac.uk

Transparency declaration: The guarantor affirms that the manuscript is an honest, accurate, and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as planned (and, if relevant, registered) have been explained.

Funding: This study was funded by a research grant from MSD. The researchers are all independent from the funder (MSD).

Study sponsorship: The study sponsor (MSD) was not involved in study design or the collection, analysis, and interpretation of data or the writing of the article or the decision to submit it for publication.

Competing interests. All authors have completed the ICMJE uniform disclosure form at www.icmje.org/coi_disclosure.pdf and declare that this study was funded by MSD and that Paul T Seed is partly funded by Tommy's (Registered charity no. 1060508). There are no other financial relationships with any organisations that might have an interest in the submitted work in the previous three years and no other relationships or activities that could appear to have influenced the submitted work.

Contributorship statement

GR, JP, JW and RR designed the study, GR and JP sampled the health materials, JW led on the assessment of the health materials, MR, PTS, and RR advised on analysis, MR and GR undertook the analysis. All authors commented on the analysis and contributed to the paper. All authors have approved the submitted version of the paper and agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

Transparency declaration

The lead author affirms that the manuscript is an honest, accurate, and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as planned (and, if relevant, registered) have been explained.

Abstract

Background: Low health literacy is associated with poorer health and higher mortality. It is important to understand the extent to which population health literacy skills match health system demands.

Aim: To identify literacy and numeracy competency threshold(s) for health information in current use in England, and to describe the working age population in relation to these.

Design and setting: An observational study comparing English health materials with an English national skills dataset of the working-age population (the Skills for Life (SfL) Survey 2011).

Method: A sample of health materials was assessed. Competency thresholds to understand and use the materials were identified. The proportion of the population above and below these thresholds, and the socio-demographic variables associated with a greater risk of being below the thresholds, were described.

Results: Sixty-four health materials were sampled. Two competency thresholds were identified: text-only, and text + numeracy. Of those SfL participants for whom literacy skills levels were available, 2515 (43%) were below the threshold; of the 4871 whose literacy and numeracy skills were available, 2905 (61%) were below the threshold. Social determinants of health were associated with competency. Multivariable analysis resulted in some variables becoming non-significant or reduced in effect.

Conclusions. There is a significant mismatch between the complexity of health materials and the skills of the English adult working-age population. Those most in need of health information have the least access to it. Three strategies known to be efficacious are building population skills, improving health professionals' communication, and improving written health information.

Key words:

Health literacy

Health System Complexity

Primary care

Public Health

How this fits in

Low health literacy is associated with lower health, higher risk of long-term conditions, more difficulty managing conditions, and, in older people, higher mortality. This study explored the extent to which the level of literacy and numeracy required to understand and use health information in England matched the literacy and numeracy skills of the population. A significant proportion of the population did not have the skills to fully understand and use the health materials sampled. Approaches to address this include developing a rigorous approach to developing more accessible health information, and undertaking more research to explore the health and economic impact of low health literacy in England.

Introduction

Health literacy skills are ‘the … skills which determine the motivation and ability of individuals to gain access to, understand, and use information in ways which promote and maintain good health’ (1), the most fundamental of which are those ‘needed … to be able to function in everyday (health) situations to access and use information’ (2). Low health literacy is associated with greater use of medical services, lower use of preventative care, greater difficulty managing long term illnesses (3), lower levels of health (3-5) and higher mortality in older people (3, 4).

The complexity of health information and systems is well recognized (6). Well over 1,500 peer reviewed articles indicate that health texts are written at levels that exceed the average readings skills of the public (7, 8) thus rendering health information inaccessible. Finding ways to reduce this skills / demands mismatch across populations is a priority (9). Measures of population literacy and numeracy skills, developed by education experts, provide highly accurate estimates of population skills in multiple settings e.g. finance, leisure, and everyday activities (10). Missing is an evaluation of the complexity of the demands of the system. This study was undertaken to provide measures of ‘both sides of the coin’ and thereby describe a match or mismatch. It brought together expertise from clinical practice, public Health, and education. The objectives of the study were to (1) use the English national skills framework to assess a range of health materials (2) determine the threshold of health literacy and numeracy skills needed to understand and use the sampled health materials (3) describe the English working age population in relation to these thresholds.

Method

Setting.

England using English health materials and data from the English 2011 skills survey (Skills for Life (SfL)) (10).

Sampling and assessing health materials

Health materials were purposively sampled using a framework developed to capture the range of literacy and numeracy skills needed to become and stay healthy (11). GR and JP sampled materials from topics within each framework area. All items were publically available in General Practitioner surgeries, hospitals, community pharmacies, public libraries or via the internet. The framework, with examples and chosen subject areas, is shown in table 1.

Table 1 about here

The sampled materials were independently assessed by a group of external experts i.e. people at a senior level (consultant level or equivalent) in areas of relevance to health literacy. Health trainers (non-clinical health workers trained to provide patient self-management advice and signposting) were included. Prior knowledge of health literacy was not required. Fifty-two experts were approached through the UK health literacy group and through local contacts in London and Manchester; 33 (63%) agreed to participate; 7 nurses, 6 General Practitioners, 6 hospital consultants, five dieticians/nutritionists, two NHS managers, two road safety experts, two health trainers, two Health Promotion experts and one Public Health consultant.

Experts were asked the extent to which the items represented materials in everyday use, the frequency with which patients / members of the public would be exposed to the material, and the potential impact on health of failure to understand and use the information. The experts were asked to identify areas where additional relevant material should be sampled. This additional sampling and assessment process followed the same protocol. Both cycles were undertaken using a web-based survey.

All the materials were assessed for their literacy and numeracy complexity using the English National Qualifications Framework (NQF) (12); (see table 2) by education experts.

Table 2 about here

For written text and (where present) numerical information, the reviewers assessed the level of skill required to read, understand and use the information. Materials were assessed up to and including level 2, the skills level expected to be achieved by English students at age 16 years (5 grade A-C GCSE examinations); materials above this level were grouped in with level 2.

The materials were not tested directly with SfL 2011 participants. Data on skills were taken directly from the SfL 2011 data.

Population health literacy competency

The competency required to understand and use the health materials was determined. A threshold of 70% was adopted, reflecting usual English practice, and similar to the US threshold of 67% (13) . This made allowances for individual errors during testing, assumed that understanding the majority of health materials would be sufficient for an individual to be 'competent', and mitigated against chance sampling of materials more difficult than those in everyday circulation.

Each item was coded for both literacy and, where appropriate, numeracy difficulty, and a basic and cumulative frequency of the number of materials at each skills level tabulated, with the threshold set as described above, weighted according to the expert panel assessments. The proportion of the population above and below these competency thresholds were derived from the 2011 Skills for Life (SfL 2011) survey, described in Box 1 (10).

Box 1 about here

Survey data were weighted to ensure they were representative of the English resident working-age population. Statistical analyses were undertaken using IBM PASW v19, SPSS v21 and Stata v12. Initial univariable analyses explored the association between low functional health literacy and socio-demographic determinants of health (14, 15) and / or with low health literacy (16-18). The variables explored are shown in table 3.

Table 3 about here

The research team developed a new variable, the 'Access to Information' (ATI) Index. The background data collected in SfL 2011 included information on access to information sources (books, newspapers and magazines), frequency of reading, access to a computer at home or at work, and access to the internet at home and at work. The ATI index was an unweighted composite score of access to these potential sources of health information.

Separate analyses were undertaken for literacy-only and for literacy+numeracy competency. For each variable, the odds of an individual being in the 'below threshold' group was calculated; for each variable the odds ratios, with 95% confidence intervals and statistical significance ($p<0.05$), were then calculated, with the group with the lowest odds for being below the threshold being taken as the reference group.

In order to explore which variables remained significant when all the variables were considered together, multivariable logistic regression was undertaken. Odds ratios, adjusted for all the other variables in the model, and with 95% confidence intervals and statistical significance levels, were then calculated for each variable.

As this was an observational study, STROBE guidelines (19) were followed.

Ethics

The sampled health materials were all publically available and in use, and the SfL Survey data were fully anonymised and publically available. Ethics approval was therefore not required.

Results

Assessment of Health materials

Sixty-four health materials were sampled. All items contained literacy (text) information, 50 also contained numeracy information and none contained just numeracy information. Details of the materials, the external expert assessments and weighting are shown in Table 4.

Table 4 about here

The representativeness of the materials was rated by the experts on a scale of 0 (not representative at all) to 3 (highly representative); mean scores per area ranged from 1.8 to 2.2. Weighting was calculated by multiplying the experts' views on frequency of exposure by potential impact of failure to understand and use the material (possible range 0 to 9). The weighting scores ranged from 3.6 to 5.0.

The threshold of health literacy and numeracy skills needed to understand and use the sampled health materials

The competency thresholds of the materials were then assessed against the National Qualifications Framework (NQF: see table 2 above). All 64 items contained written text. Following weighting, 27% of the items were at literacy level 1 or below, with 73% at level 2 or above. The competency threshold for the text element of materials was thus Level 2. Fifty of the health materials also had a numeracy component. Weighted assessments showed that 39% were at Entry Level 3 or below, and 61% were at level 1 or above. The competency threshold for the numeracy components was therefore set at Level 1.

Thus two competency thresholds were identified; text-only materials (literacy level 2), and text + numeracy materials (literacy level 2 + numeracy level 1).

Population health literacy skills.

Analyses were undertaken separately for health literacy (text only) and health literacy+numeracy. Results for both analyses were similar; we have thus presented only the literacy-only results; the literacy+numeracy results are available in supplementary tables or from the corresponding author.

The characteristics of the sample for the variables analysed for the literacy threshold, including missing data, are shown in table 5.

Table 5 about here

The characteristics of the sample for the variables analysed for the literacy+numeracy threshold, including missing data, are shown in supplementary table 5s. Of those who took both the literacy and numeracy assessment for whom data were available, 2905 participants (61%) were below the threshold and 1862 (39%) were at or above the threshold.

Univariable and multivariable analyses

The unadjusted (univariable) and adjusted (multivariable) odds ratios for the variables studied are shown in table 6. The results for the literacy+numeracy analysis are shown in supplementary table 6s.

Table 6 about here

All the demographic, educational and economic variables were related to competency with odds ratios around 2 before adjustment. Measures commonly linked to deprivation were also linked to low health literacy. After adjustment, being born in the UK and not being in work were not significant; the effect of several other predictors was reduced.

The Access to Information (ATI) Index showed that those below the competency thresholds had statistically significantly lower access to potential sources of health information in both the unadjusted and adjusted analyses.

Discussion

Summary

Sixty-four examples of publically available health materials were sampled across the five health activity areas. All 64 items contained literacy (text) information, 50 also contained numeracy information, and none just numeracy information. The sampled health materials were written at a level of complexity above the skills levels of a significant proportion of the English working age population; 43% of people were below the competency threshold to fully understand and use the text element of the health materials; whilst 61% of the population where below the competency threshold for materials that also had a numeric component.

Analysis of social determinants of health showed that all were highly statistically significantly associated with greater odds of being below the competency thresholds; the exception being age (literacy+numeracy competency). Whilst not all the variables remained in the multivariable model, both literacy-only and literacy+numeracy models showed strong associations with known social determinants of health. Those with the most need for access to health information (i.e. those below the competency thresholds) had the least access to it.

Strengths

This study focuses on a key aspect in health literacy; the extent to which population literacy and numeracy skills match the complexity of health information materials. It describes a method to evaluate the extent of this mismatch in the health service in England.

The materials sampled were from a wide range of areas important for health. The external experts rated the materials as moderately representative of those in everyday use and felt that clinically significant numbers of patients and the public would be exposed to them, with moderate impacts on their health should they fail to understand them.

The literacy and numeracy competencies were determined from a recent large national study of the skills of the English working-age population. The survey participants were purposively sampled to ensure representativeness for the population under study. In addition to giving detailed socio-demographic data, participants undertook skills tests developed by education testing experts.

Limitations

This study was limited by a small sample of health materials. Furthermore, the calculated match between the skills of individuals and the complexity of materials does not consider peoples' broader resources; for instance access to family and to health professionals who can explain the materials to them. Nevertheless, inability to fully understand health materials must put individuals at greater risk (3, 5).

The SfL survey only assessed the skills of the population aged 16 to 65 years. There are numerous studies showing the impact of low health literacy in older people (4, 20, 21); given cognitive decline with age, and our findings of lower health literacy in the older people within the cohort in the SfL study, it is likely that there is even greater unmet need in older people.

Comparison with existing literature

To our knowledge, this is the first study to describe a method for measuring the gap between health system complexity and the health literacy skills of the people for whom it is designed. It can be argued that it is the size of this mismatch that is more important that the absolute complexity of the system or the skills of those using it. Despite the different method adopted in this study, however, the proportion of the population below the competency thresholds are similar to the proportions considered to have sub-optimal levels of health literacy in other industrialised countries (5, 16-18).

Implications for research and practice

This study has found that health materials are too complex for the skills of a significant proportion of the population, resulting in less access to health information to promote health and to prevent and manage illness. Furthermore, it is those who are at the highest risk of poorer health (those from ethnic minority groups, low-income low status jobs etc.) who are most likely to be below the health literacy competency thresholds. The health information needed by these groups will have to be provided by the NHS as those with the most need to health information have the least access to other information sources.

The size and importance of the problem means that health service staff must be aware of the issues and work to develop effective solutions. GPs have a key role both through the 90% of face to face patient contacts that take place in General Practice and through their roles as commissioners of local health services. Rigour should be applied to the development of health materials, to ensure they are written at accessible skills levels. Non-written forms of communication (audio, visual, internet) or use of mobile phone applications could be promoted, particularly for more vulnerable groups.

In the longer-term, the raising of general literacy and numeracy skills through schools and adult education will have health benefits in addition to better life skills and employability. General Practitioners are ideally placed to develop partnerships with educators to help develop health literacy and numeracy skills in the communities they serve.

Multiple studies have demonstrated the associations between low health literacy and worse health outcomes (3) and poorer health (5), however impact on life expectancy has so far only been demonstrated in older people (3, 4). Future research should explore the associations between health literacy and life expectancy in working-age populations. To date most health literacy studies have been observational; it is important to develop and test interventions to improve health literacy, and assess the impact on health (3). Finally, there have been limited numbers of health economic evaluations of the impact of health literacy, with inconclusive results (3). The UK annual health expenditure (2011) was £142.8 billion (22); it is important to assess the impact of health literacy on health care costs, and to ensure that assessment of health literacy interventions includes an economic evaluation.

References

1. Nutbeam D. Health Promotion Glossary. Health Promotion International. 1999;13(4):349-64.
2. Nutbeam D. Health literacy as a public health goal: a challenge for contemporary health education and communication strategies into the 21st century. Health Promotion International. 2000 15(3):259-67.
3. Berkman ND, Sheridan SL, Donahue KE, et al. Health literacy interventions and outcomes: An updated systematic review. Rockville, MD: Agency for Healthcare Research and Quality., 2011 Contract No.: 11-E006.
4. Bostock S, Steptoe A. Association between low functional health literacy and mortality in older adults: longitudinal cohort study. BMJ. 2012;344:e1602.
5. HLS-EU Consortium: Comparative report of health literacy in eight EU member states. The European Health Literacy Survey (HLS-EU). 2012.
6. Rudd RE, McCray AT, Nutbeam D. Health literacy and definition of terms. In: Begoray DL, Gillis D, Rowlands G, editors. Health Literacy in Context: International Perspectives. New York: Nova Science Inc; 2012.
7. Rudd RE, Moeykens BA, Colton TC. Health and literacy: A review of medical and public health literature. In: Comings JP, Garner B, Smith C, editors. The Annual Review of Adult Learning and Literacy. San Francisco, CA: Jossey-Bass Publishers; 2000. p. 158-99.
8. Rudd RE, Anderson JE, Nath C, et al. Health literacy: An update of medical and public health literature. In: Comings JP, Garner B, Smith C, editors. Review of Adult Learning and Literacy. 7. Mahwah, NJ:: Lawrence Erlbaum Associates; 2007.
9. National Action Plan to Improve Health Literacy. Washington D.C.: US Department of Health and Human Services. Office of Disease Prevention and Health Promotion., 2010.
10. The 2011 Skills for Life Survey: A Survey of Literacy, Numeracy and ICT Levels in England. London: Department for Business Innovation and Skills 2012 Contract No.: BIS Research paper number 81.
11. Rudd R, Kirsch I, Yamamoto K. Literacy and Health in America. Princeton, NJ: Education Testing Service 2004.
12. The National Qualifications Framework. 2006.
13. Measuring literacy: Performance levels for adults. Committee on Performance Levels for Adult Literacy, Board on Testing and Assessment. . Washington DC: Center for Education. Division of Behavioral and Social Sciences and Education. National Research Council (US), 2005.
14. CSDH. Closing the gap in a generation: health equity through action on the social determinants of health. Final Report of the Commission on Social Determinants of Health. Geneva: World Health Organization, 2008.
15. Fair Society, Healthy Lives. Strategic Review of Health inequalities in England post 2010. The Marmot Review. 2010.
16. Rudd RE. Health literacy skills of U.S. adults. American journal of health behavior. 2007;31 Suppl 1:S8-18.
17. Health Literacy in Canada. A Healthy Understanding. Ottowa: Canadian Council on Learning, 2008.
18. Health Literacy, Australia. Canberra: Australian Bureau of Statistics, 2006.

19. von Elm E, Altman DG, Egger M, et al. Strengthening the reporting of observational studies in epidemiology (STROBE) statement: guidelines for reporting observational studies. BMJ. 2007;335.
20. Baker DW, Wolf MS, Feinglass J, et al. Health literacy and mortality among elderly persons. Archives of Internal Medicine. 2007;167(14):1503-9.
21. Wolf MS, Gazmararian JA, Baker DW. Health literacy and health risk behaviors among older adults. Am J Prev Med. 2007;32(1):19-24.
22. Payne CS. Expenditure on healthcare in the UK: 2011. London: Office for National statistics (UK).