



Characteristics of people with low health literacy on coronary heart disease GP registers in South London

Journal:	<i>BMJ Open</i>
Manuscript ID:	bmjopen-2012-001503
Article Type:	Research
Date Submitted by the Author:	03-Aug-2012
Complete List of Authors:	Rowlands, Gillian; London South Bank University, Institute of Primary Care and Public Health Mehay, Anita; Institute of Psychiatry, Section of Primary Care Mental Health Hampshire, Sally; Institute of Psychiatry, Section of Primary Care Mental Health Phillips, Rachel; Institute of Psychiatry, Section of Primary Care Mental Health Mann, Anthony; Institute of Psychiatry, Health Service and Population Research Steptoe, Andrew; University College London, UCL Institute of Epidemiology and Health Care Walters, Paul; Institute of Psychiatry, Section of Primary Care Mental Health Tylee, Andre; Institute of Psychiatry
Primary Subject Heading:	Public health
Secondary Subject Heading:	General practice / Family practice
Keywords:	Health literacy, Cardiovascular disease, Prevalence

SCHOLARONE™
Manuscripts

1
2
3 **Characteristics of people with low health literacy on coronary heart**
4 **disease GP registers in South London**

5
6 **Lead, corresponding author and paper guarantor**

7
8 **Gill Rowlands¹**
9

10
11 Professor of Health Disparities
12 Faculty of Health and Social Care
13 London South Bank University
14 London SE1 0AA
15
16 rowlang2@lsbu.ac.uk
17
18
19

20
21 **Co-authors**
22

23
24 **Anita Mehay²** BSc (Hons) MSc. Research Assistant
25

26 **Sally Hampshire¹** BSc MSc Research Assistant
27

28 **Rachel Phillips²** BSc MSc GradStat. Research Fellow
29

30 **Anthony Mann²** MD FRCP FRCPsych. Emeritus Professor
31

32 **Andrew Steptoe³** BA MA DPhil DSC. British Heart Foundation Professor of
33 Psychology
34

35 **Paul Walters²** PhD MRCPsych. Research Fellow
36

37 **Andre Tylee²** MD FRCGP MRCPsych. Head, Section of Primary Care Mental
38 Health
39

40
41 **Word count: abstract 300 words, main text 1096 words.**
42
43

44
45 **Study design:** cross-sectional survey
46

47
48 **Statements:** The Corresponding Author has the right to grant on behalf of all
49 authors and does grant on behalf of all authors, an exclusive licence (or non
50 exclusive for government employees) on a worldwide basis to the BMJ
51 Publishing Group Ltd to permit this article (if accepted) to be published in BMJ
52
53
54

55
56 ¹ London South Bank University

57 ² Institute of Psychiatry, Kings College London

58 ³ University College London
59
60

1
2
3 editions and any other BMJ PGL products and sublicences such use and
4 exploit all subsidiary rights, as set out in their licence.
5
6
7

8 Competing interests: AT is partly employed by the NIHR Institute of Psychiatry
9 and South London and Maudsley Foundation Trust Mental Health Biomedical
10 Research Centre.
11
12

13
14 Funding Statement: this research received no specific funding.
15
16

17
18 Data Sharing Statement: There are no additional unpublished data from this
19 study
20
21

22
23 All authors have completed the Unified Competing Interest form
24 **at www.icmje.org/coi_disclosure.pdf** (available on request from the
25 corresponding author) and declare: no support from any organisation for the
26 submitted work, no financial relationships with any organisations that might
27 have an interest in the submitted work in the previous three years, no other
28 relationships or activities that could appear to have influenced the submitted
29 work.
30
31
32
33
34
35

36 **Contributions:**

37
38 GR Led on development of the research idea, contributed to interpretation of
39 result, and led on writing the paper
40

41 AM collected research data and contributed to interpretation of results and
42 writing the paper
43

44 SH collected research data and contributed to interpretation of results and
45 writing the paper
46
47

48 RP led on statistical analysis of the data and interpretation of the results
49

50 AM co-developed the UPBEAT cohort study in which the study is sited,
51 contributed to the research idea, contributed to interpretation of results and
52 writing the paper
53

54 AS contributed to the project design, analysis of results and writing the paper
55

56 PW contributed to the research idea, interpretation of the results and writing
57 the paper
58
59
60

1
2
3 AT led o the development of the UPBEAT cohort study in which the study is
4 sited, contributed to the research idea, contributed to interpretation of results
5 and writing the paper
6
7
8

9
10 All authors have approved the final version

11 **Abstract (300 words)**

12
13 *Objective.* To explore characteristics associated with, and prevalence of, low
14 health literacy in patients recruited to investigate the role of depression in
15 patients on General Practice (GP) Coronary Heart Disease (CHD) registers
16 (the Up-Beat UK study).
17
18

19
20 *Design.* Cross-sectional cohort. The health literacy measure was the Rapid
21 Estimate of Health Literacy in Medicine (REALM). Univariable analyses
22 identified characteristics associated with low health literacy and compared
23 health service use between health literacy statuses. Those variables where
24 there was a statistically significant/borderline significant difference between
25 health literacy statuses were entered into a multivariable model.
26
27
28

29
30 *Setting.* 16 general practices in south London, UK.

31
32 *Participants:* Inclusion: patients >18 years, registered with a GP and on a GP
33 CHD register. Exclusion: patients temporarily registered.
34

35
36 *Primary outcome measure:* REALM.

37
38 *Results.* Of the 803 Up-Beat cohort participants, 687 (85.55%) completed the
39 REALM of whom 92 (13.39%) had low health literacy. A further 28 participants
40 were excluded from the multivariable analysis due to missing predictor
41 variable data, leaving a sample of 659. The variables remaining in the final
42 model were age, gender, ethnicity, IMD score, years of education,
43 employment; BMI and alcohol intake, and anxiety scores (Hospital Anxiety
44 and Depression Scale (HADS)). Univariable analysis also showed that people
45 with low health literacy may have more, and longer, practice nurse
46 consultations than people with adequate health literacy.
47
48
49

50
51 *Conclusions.* There is a disadvantaged group of people on GP CHD registers
52 with low health literacy. The multivariable model showed that patients with low
53 health literacy have significantly higher anxiety levels than people with
54 adequate health literacy. In addition, the univariable analyses show that such
55 patients have more, and longer, consultations with practice nurses. We will
56
57
58
59
60

1
2
3 collect 4-year longitudinal cohort data to explore the impact of health literacy
4 in people on GP CHD registers and the impact of health literacy on health
5 service use.
6
7
8
9

10 11 **Introduction**

12 Health literacy, 'the cognitive and social skills that determine the motivation
13 and ability of individuals to (access), understand and use information in ways
14 that promote and maintain good health' (1) is a social determinant of health
15 (2). Whilst associated with other social determinants e.g. ethnicity, income,
16 education, and socio-demographic status (SES), it has an independent
17 association with poorer health (3). There are no data on health literacy levels
18 in England; however the 2011 national skills survey has shown that 15% of
19 the adult population (=5 million people) are 'functionally illiterate' (4) (i.e. have
20 insufficient literacy skills to achieve their potential in life and society (5)). It is
21 reasonable to assume that a similar proportion also have low health literacy.
22
23
24
25
26
27
28
29
30

31 Low health literacy has greatest impact in complex health conditions when
32 patients have to understand procedures, manage medication, and attend
33 multiple appointments. US studies have shown that adults with low health
34 literacy have a higher prevalence of diabetes and heart failure, worse physical
35 and mental health, and higher all-cause mortality (6). There is little research
36 on low health literacy and coronary heart disease (CHD), prompting us to
37 explore this within a longitudinal cohort of patients recruited to investigate the
38 role of depression in patients on General Practice (GP) CHD registers (7).
39 This short report presents initial findings on the prevalence and characteristics
40 of people with CHD and low health literacy.
41
42
43
44
45
46
47
48

49 **Method**

50 The design, recruitment, power calculation, and measures used in the Up-
51 Beat cohort study were granted ethical approval by the Bexley and Greenwich
52 Research Ethics Committee (REC Reference: 07/H0809/38) (7). Health
53 literacy was measured using the Rapid Estimate of Health Literacy in
54 Medicine (REALM) (8), a 66-item health word pronunciation test highly
55
56
57
58
59
60

1
2
3 correlated with other measures of health literacy (9, 10) and widely used in
4 research studies (3). People with a score of < 58 out of the possible 66 are
5 considered to have low health literacy.
6
7

8
9
10 Study design. A cross-sectional analysis of baseline data from the Up-Beat
11 UK Cohort Study (7).
12

13 14 15 Statistical Analysis

16 In order to identify the factors to be entered into the multivariable regression
17 model, the characteristics of those with low health literacy were compared to
18 those with adequate health literacy using χ^2 tests (categorical variables) and t-
19 tests (continuous variables). Those characteristics where there was a
20 statistically significant ($p < 0.05$) or borderline significant difference between
21 people with low and adequate health literacy were entered into a multivariable
22 model; logistic regression was used to model predictors of low health literacy.
23 The fit for the model was assessed by the C statistic (ROC curve) and the
24 Hosmer-Lemeshow goodness of fit χ^2 test.
25
26
27
28
29
30
31
32

33 Analyses were performed using Stata version 11.2.
34
35

36 **Results**

37
38
39 Cohort characteristics are detailed elsewhere (7). Cohort recruitment and a
40 study flow diagram are shown in figure 1.
41
42
43

44
45 *Figure about here.*
46
47

48 The results of the univariable and multivariable analyses are shown in table 1.
49
50
51
52
53
54
55
56
57
58
59
60

Table: Characteristics by Health Literacy

		Health Literacy		Univariable analysis	Multivariable analysis
		Adequate	Low		
		N (%)	N (%)	N=687	N=659
Total		595 (86.61)	92 (13.39)		
				P-value ⁽¹⁾	Adjusted odds of having low health literacy (p-values)
Socio-demographic characteristics					
Gender	Male	409 (68.74)	75 (81.52)	0.012	0.36 (<0.001)
	Female	186 (31.26)	17 (18.48)		
Ethnicity	White	536 (90.08)	69 (75.00)	<0.001	3.33 (<0.001)
	Other	59 (9.92)	23 (25.00)		
Age, Mean (SD)	Years	71.13 (10.40)	68.62 (12.09)	0.061 ⁽²⁾	1.00 (0.933)
Index of Multiple Deprivation score, Mean (SD)	Range 0-100	18.37 (13.75)	25.10 (13.59)	<0.001	1.02 (0.056)
Time in education, Mean (SD)	Years	11.99 (3.37)	10.90 (2.57)	<0.001 ⁽²⁾	0.83 (<0.001)
Employment status	Unemployed/student	14 (2.36)	10 (10.99)	<0.001	0.063
	Paid employment	120 (20.24)	15 (16.48)		
	Retired/Housewife	459 (77.40)	66 (72.53)		
Lifestyle Characteristics					
Alcohol intake (Units)	Doesn't drink	139 (23.40)	41 (45.05)	<0.001	<0.001
	1-10 units	297 (50.00)	36 (39.56)		
	11-20 units	89 (14.98)	7 (7.69)		
	Greater than 21 units	69 (11.62)	7 (7.69)		
BMI	Underweight/Normal	147 (25.34)	13 (14.29)	0.035	0.033
	Overweight	257 (44.31)	41 (45.05)		
	Obese	176 (30.34)	37 (40.66)		
Mental Health					
Depression score, Mean (SD)		2.93 (3.21)	4.07 (3.55)	0.002	
Anxiety score, Mean (SD)		4.47 (4.23)	6.16 (4.96)	0.002 ⁽²⁾	1.06 (0.035)
Health utilisation in the 6 months prior to baseline					
Number of practice nurse visits, Mean (SD)		0.92 (1.89)	1.21 (2.01)	0.044 ⁽³⁾	
Duration of practice nurse visit, Mean (SD)		5.06 (7.08)	6.79 (8.41)	0.034 ⁽³⁾	
All other service use variables ⁽⁴⁾				0.191 ⁽⁵⁾ -0.990 ⁽⁶⁾	
¹ P-value from t-test for continuous variables and chi-squared tests for categorical variables					
² Unequal variances t-test used					
³ Wilcoxon rank sum test					

⁴ Number of Accident and Emergency visits, Day hospital and in-patient admissions (days), outpatient visits, GP visits (number, duration), district nurse visits (number, duration), other medical visits (number, duration), other care based visits (number, duration), informal care visits number).

⁵ Number of Accident and Emergency visits

⁶ Number (days) in-patient visits

Of the 803 cohort participants 687 (85.55%) completed the REALM questionnaire. The 116 non-responders were excluded from the analyses. Non-responders lived in more socio-economically deprived areas and had received fewer years of education than those who completed the REALM. There was no difference in ethnicity (responders vs non-responders).

Of the 687 participants who completed the REALM, 92 (13.39%) had low health literacy. For the multivariable analysis a further 28 patients were excluded due to missing predictor variable data, leaving a total sample of 659.

The variables remaining in the final model were age, gender, ethnicity (white versus other), IMD score, years of education, employment; BMI and alcohol intake, and anxiety scores (Hospital Anxiety and Depression Scale (HADS)) (11). There was a 6% increase in the odds of low health literacy for every single unit increase in the anxiety score on HADS (range 0-21).

The association between health literacy and IMD scores and employment were borderline significant. There was no significant difference in age.

Service use analysis (univariable only) showed that people with low health literacy had significantly more, and longer, GP practice nurse consultations than people with adequate health literacy, but other service use showed no differences between groups.

Discussion

Key findings

This study confirms that the characteristics of patients with low health literacy on UK GP CHD registers are similar to those seen in other long-term conditions in studies undertaken in other industrialised countries (i.e.,

1
2
3 membership of a minority ethnic group, socio-economic deprivation, fewer
4 years in education, and lower income (6)). The prevalence of low health
5 literacy is close to that predicted from national general literacy levels (4).
6
7

8
9
10 In addition people on GP CHD registers who have higher anxiety levels are
11 more likely to have low health literacy than people with lower anxiety levels.
12 This persists in the multivariable model, indicating an association over and
13 above that already known to exist between anxiety and low socio-economic
14 status (12, 13). This may reflect the findings of Ussher et al that CHD patients
15 with low health literacy have increased difficulty understanding information,
16 less knowledge of heart problems, and increased discomfort about asking for
17 explanations (14). The finding in the univariable analysis that patients with low
18 health literacy had more contact with practice nurses but not with other health
19 services requires further investigation.
20
21
22
23
24
25
26

27 28 *Study limitations*

29 As a cross-sectional study this project cannot demonstrate causality or the
30 impact of low health literacy over time.
31
32
33

34 Our findings may underestimate of the true picture; the 14.45% of participants
35 who declined to do the REALM share the characteristics of people with low
36 health literacy and may have declined because of reading difficulties.
37
38
39

40 Our findings of more frequent, and longer, GP practice nurse consultations
41 should be interpreted with caution, as this was found during univariable
42 analysis with no other factors controlled for; no service use data were entered
43 into the multivariable model. The above preliminary finding thus requires more
44 detailed health economic analysis and interpretation.
45
46
47
48

49 Finally, the REALM, although highly correlated with tests of functional health
50 and general literacy, is not itself a test of functional skills but of pronunciation.
51
52
53
54

55 56 *Summary*

57
58
59
60

1
2
3 Our findings indicate that there is a disadvantaged group of people on GP
4 CHD registers who have low health literacy in addition to other socio-
5 demographic barriers to health. A new finding is that these people have
6 significantly higher anxiety levels than people with adequate health literacy.
7
8
9

10 11 *Next steps*

12 Our possible finding that people on GP CHD registers with lower health
13 literacy consulted practice nurses more frequently will inform future Up-Beat
14 pilot interventions (7) and our longitudinal cohort data will enable us to explore
15 the impact of low health literacy on patients on GP CHD registers, and on
16 their health service use.
17
18
19
20
21

22 23 **Acknowledgements**

24 Many thanks to the 16 South London practices who participated in the
25 UPBEAT-UK study.
26
27
28

29 This report/article presents independent research commissioned by the
30 National Institute for Health Research (NIHR) under its Programme Grants for
31 Applied Research scheme (RP-PG-0606-1048). The views expressed in this
32 publication are those of the author(s) and not necessarily those of the NHS,
33 the NIHR or the Department of Health.
34
35
36
37
38

39 AT is partly employed by the NIHR Institute of Psychiatry and South London
40 and Maudsley Foundation Trust Mental Health Biomedical Research Centre.
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

References

- 1 Health Literacy: A Prescription to End Confusion. Washington DC: Institute of Medicine, 2004.
- 2 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.
- 3 Paasche-Orlow MK, Parker RM, Gazmararian JA, et al. The prevalence of limited health literacy. *J Gen Intern Med.* 2005;**20**(2):175-84. Epub 2005/04/20.
- 4 Skills for Life Survey: Headline Findings. Department for Business Innovations and Skills 2011 Research Report No.: 57.
- 5 Moser C. A fresh start: the report of the working party on literacy and numeracy. 1999:-.
- 6 Wolf MS, Gazmararian JA, Baker DW. Health literacy and functional health status in older adults. *Arch Int Med.* 2005;**165**:1946-52.
- 7 Tylee A, Ashworth M, Barley E, et al. Up-Beat UK: A programme of research into the relationship between coronary heart disease and depression in primary care patients. *BMC Family Practice.* 2011;**12**:38doi:10.1186/1471-2296-12-38.
- 8 Davis TC, Long SW, Jackson RH, et al. Rapid Estimate of Adult Literacy in Medicine: A Shortened Screening Instrument. *Family Medicine.* 1993;**25**(6):391-5.
- 9 Parker RM, Baker DW, Williams MV, et al. The Test of Functional Health Literacy in Adults (TOFHLA): a new instrument for measuring patients' literacy skills. *J Gen Intern Med.* 1995;**10**:537-42.
- 10 Weiss BD, Mays MZ, Martz W, et al. Quick assessment of literacy in primary care: the newest vital sign. *Ann Fam Med.* 2005;**3**(6):514-22. Epub 2005/12/13.

1
2
3 11 Hamilton M. Development of a rating scale for primary depressive illness.
4 Br J Soc Clin Psychol. 1967;**6**(4):278-96. Epub 1967/12/01.

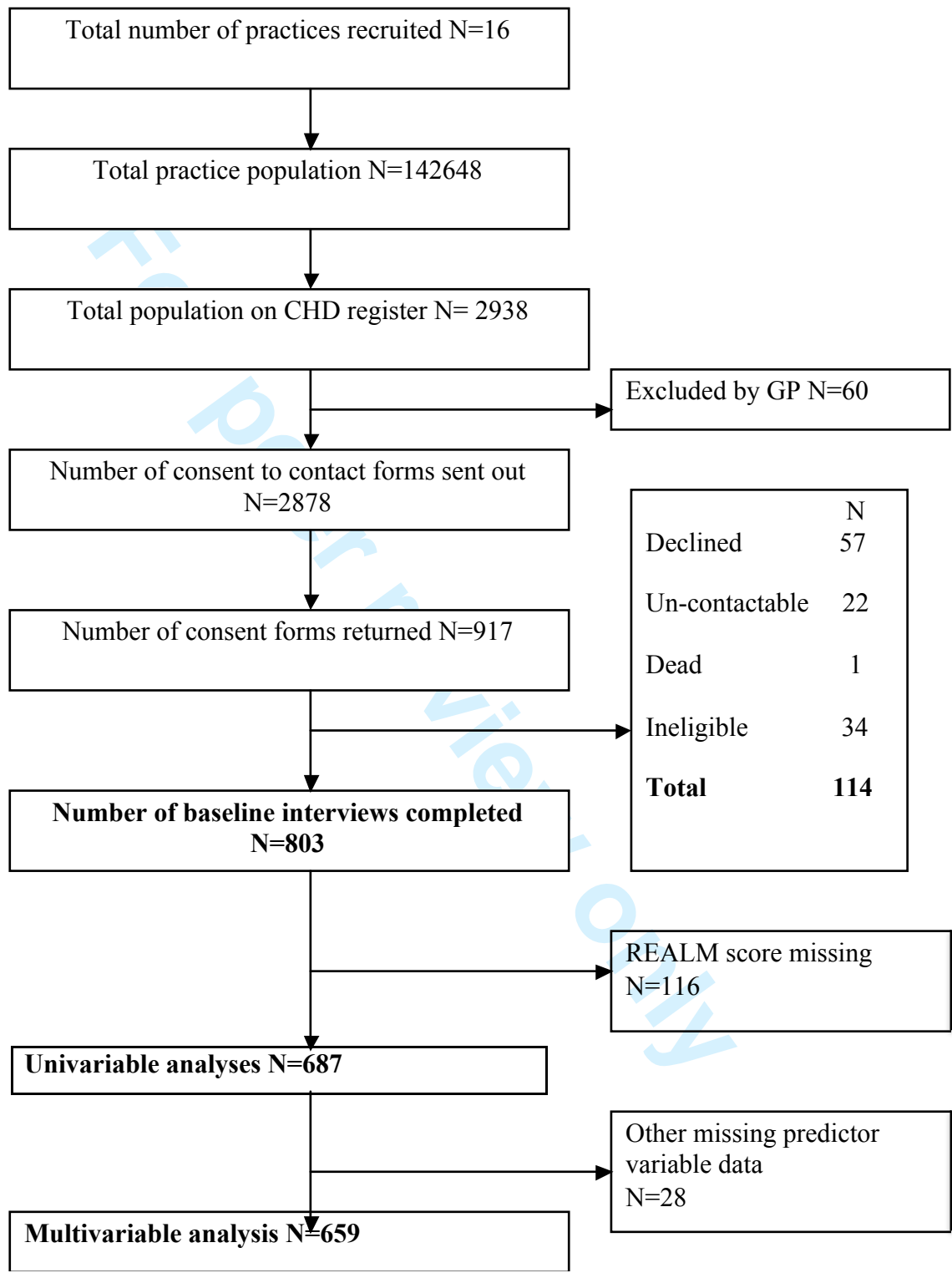
5
6 12 Wolff BC, Santiago CD, Wadsworth ME. Poverty and involuntary
7 engagement stress responses: examining the link to anxiety and aggression
8 within low-income families. Anxiety Stress Coping. 2009;**22**(3):309-25. Epub
9 2009/03/03.

10
11
12 13 Najman JM, Hayatbakhsh MR, Clavarino A, et al. Family poverty over the
14 early life course and recurrent adolescent and young adult anxiety and
15 depression: a longitudinal study. Am J Public Health. 2010;**100**(9):1719-23.
16 Epub 2010/07/17.

17
18
19 14 Ussher M, Ibrahim S, Reid F, et al. Psychosocial correlates of health
20 literacy among older patients with coronary heart disease. J Health Commun.
21 2010;**15**(7):788-804. Epub 2010/11/26.
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Exploring indicators of low health literacy in a cohort with symptomatic Coronary Heart Disease

Figure: Study recruitment: Consort diagram





Characteristics of people with low health literacy on coronary heart disease GP registers in South London

Journal:	<i>BMJ Open</i>
Manuscript ID:	bmjopen-2012-001503.R1
Article Type:	Research
Date Submitted by the Author:	19-Oct-2012
Complete List of Authors:	Rowlands, Gillian; London South Bank University, Institute of Primary Care and Public Health Mehay, Anita; Institute of Psychiatry, Section of Primary Care Mental Health Hampshire, Sally; Institute of Psychiatry, Section of Primary Care Mental Health Phillips, Rachel; Institute of Psychiatry, Section of Primary Care Mental Health Williams, Paul; Institute of Psychiatry, Section of Primary Care Mental Health Mann, Anthony; Institute of Psychiatry, Health Service and Population Research Steptoe, Andrew; University College London, UCL Institute of Epidemiology and Health Care Walters, Paul; Institute of Psychiatry, Section of Primary Care Mental Health Tylee, Andre; Institute of Psychiatry
Primary Subject Heading:	Public health
Secondary Subject Heading:	General practice / Family practice, Cardiovascular medicine, Sociology, Mental health
Keywords:	Health literacy, Cardiovascular disease, Prevalence

SCHOLARONE™
Manuscripts

1
2
3 **Characteristics of people with low health literacy on coronary heart**
4 **disease GP registers in South London**

5
6 **Lead, corresponding author and paper guarantor**

7
8 **Gill Rowlands¹**

9
10 Professor of Health Disparities

11 Faculty of Health and Social Care

12 London South Bank University

13 London SE1 0AA

14 rowlang2@lsbu.ac.uk
15
16
17
18
19

20 **Co-authors**

21 **Anita Mehay²** BSc (Hons) MSc. Research Assistant

22 **Sally Hampshire¹** BSc MSc Research Assistant

23 **Rachel Phillips²** BSc MSc GradStat. Research Fellow

24 **Paul Williams²** BSc MPH. Statistician.

25 **Anthony Mann²** MD FRCP FRCPsych. Emeritus Professor

26 **Andrew Steptoe³** BA MA DPhil DSC. British Heart Foundation Professor of
27 Psychology

28 **Paul Walters²** PhD MRCPsych. Research Fellow

29 **Andre Tylee²** MD FRCGP MRCPsych. Head, Section of Primary Care Mental
30 Health
31
32

33
34
35 **Word count: abstract 300 words, main text 1303 words.**
36
37
38
39

40
41
42 **Study design:** cross-sectional survey
43
44
45

46 **Statements:** The Corresponding Author has the right to grant on behalf of all
47 authors and does grant on behalf of all authors, an exclusive licence (or non
48 exclusive for government employees) on a worldwide basis to the BMJ
49 Publishing Group Ltd to permit this article (if accepted) to be published in BMJ
50 editions and any other BMJ PGL products and sublicences such use and
51
52
53
54

55
56 ¹ London South Bank University

57 ² Institute of Psychiatry, Kings College London

58 ³ University College London
59
60

1
2
3 exploit all subsidiary rights, as set out in their licence.
4
5

6 Competing interests: AT is partly employed by the NIHR Institute of Psychiatry
7 and South London and Maudsley Foundation Trust Mental Health Biomedical
8 Research Centre.
9
10

11
12 All authors have completed the Unified Competing Interest form
13 **at**www.icmje.org/coi_disclosure.pdf (available on request from the
14 corresponding author) and declare: no support from any organisation for the
15 submitted work, no financial relationships with any organisations that might
16 have an interest in the submitted work in the previous three years, no other
17 relationships or activities that could appear to have influenced the submitted
18 work.
19
20
21
22
23

24 **Contributions:**

25
26 GR Led on development of the research idea, contributed to interpretation of
27 result, and led on writing the paper
28

29 AM collected research data and contributed to interpretation of results and
30 writing the paper
31

32 SH collected research data and contributed to interpretation of results and
33 writing the paper
34

35 RP led on statistical analysis of the data and interpretation of the results
36

37 PW conducted additional statistical analysis and contributed to the paper
38

39 AM co-developed the UPBEAT cohort study in which the study is sited,
40 contributed to the research idea, contributed to interpretation of results and
41 writing the paper
42
43

44 AS contributed to the project design, analysis of results and writing the paper
45

46 PW contributed to the research idea, interpretation of the results and writing
47 the paper
48

49 AT led on the development of the UPBEAT cohort study in which the study is
50 sited, contributed to the research idea, contributed to interpretation of results
51 and writing the paper.
52
53
54

55
56 All authors have approved the final version
57
58
59
60

Abstract (299 words)

Objective. To explore characteristics associated with, and prevalence of, low health literacy in patients recruited to investigate the role of depression in patients on General Practice (GP) Coronary Heart Disease (CHD) registers (the Up-Beat UK study).

Design. Cross-sectional cohort. The health literacy measure was the Rapid Estimate of Health Literacy in Medicine (REALM). Univariable analyses identified characteristics associated with low health literacy and compared health service use between health literacy statuses. Those variables where there was a statistically significant/borderline significant difference between health literacy statuses were entered into a multivariable model.

Setting. 16 general practices in south London, UK.

Participants: Inclusion: patients >18 years, registered with a GP and on a GP CHD register. Exclusion: patients temporarily registered.

Primary outcome measure: REALM.

Results. Of the 803 Up-Beat cohort participants, 687 (85.55%) completed the REALM of whom 106 (15.43%) had low health literacy. Twenty-eight participants could not be included in the multivariable analysis due to missing predictor variable data, leaving a sample of 659. The variables remaining in the final model were age, gender, ethnicity, IMD score, years of education, employment; BMI and alcohol intake, and anxiety scores (Hospital Anxiety and Depression Scale (HADS)). Univariable analysis also showed that people with low health literacy may have more, and longer, practice nurse consultations than people with adequate health literacy.

Conclusions. There is a disadvantaged group of people on GP CHD registers with low health literacy. The multivariable model showed that patients with low health literacy have significantly higher anxiety levels than people with adequate health literacy. In addition, the univariable analyses show that such patients have more, and longer, consultations with practice nurses. We will collect 4-year longitudinal cohort data to explore the impact of health literacy in people on GP CHD registers and the impact of health literacy on health service use.

Article summary

Article focus

- Identifying the prevalence and characteristics of people with CHD and low health literacy on coronary heart disease GP registers in South London, UK

Key Messages

- The characteristics of patients with low health literacy on UK GP CHD registers are similar to those seen in other long-term conditions in studies undertaken in other industrialised countries
- The prevalence of low health literacy to be close to that predicted from national general literacy levels at 15%
- People on GP CHD registers who have higher anxiety levels are more likely to have low health literacy than people with lower anxiety levels

Strengths

- The data were collected within a prospective cohort study
- There were a wide range of sociodemographic data collected enabling characteristics of patients with low health literacy to be described
- The simultaneous collection of psychological and service use data enabled these to be compared between patients with low and adequate health literacy

Limitations

- As a cross-sectional study this project cannot demonstrate causality or the impact of low health literacy over time.
- The findings may underestimate of the true picture; the participants who declined to do the REALM may have declined because of reading difficulties.
- Our findings of more frequent, and longer, GP practice nurse consultations should be interpreted with caution; the above preliminary finding requires more detailed health economic analysis and interpretation
- The REALM, although highly correlated with tests of functional health and general literacy, is not itself a test of functional skills but of pronunciation

Introduction

Health literacy, 'the cognitive and social skills that determine the motivation and ability of individuals to (access), understand and use information in ways that promote and maintain good health' (1) is a social determinant of health (2). Whilst associated with other social determinants e.g. ethnicity, income, education, and socio-demographic status (SES), it has an independent association with poor health (3). International comparisons of health literacy levels are hampered by differing national definitions; however it is clear that health literacy is an important issue in many industrialised nations. The proportion of the population thought to be disadvantaged through low health literacy ranges from 19% in the US (4) to 55% in Canada (5). A recent survey of health literacy in Europe, where a common definition of health literacy was adopted, shows a range of health literacy skills between nations, with the proportion of the population having suboptimal health literacy skills ranging from 27.3% in the Netherlands to 61.4% in Bulgaria (6). There are no data on health literacy levels in England; however the 2011 national skills survey has shown that 15% of the adult population (=5 million people) are 'functionally illiterate' (7) (i.e. have insufficient literacy skills to achieve their potential in life and society (8)). It is reasonable to assume that a similar proportion also have low health literacy.

Low health literacy has greatest impact in complex health conditions when patients have to understand procedures, manage medication, and attend multiple appointments. US studies have shown that adults with low health literacy have a higher prevalence of diabetes and heart failure, worse physical and mental health, and higher all-cause mortality (9). There is little research on low health literacy and coronary heart disease (CHD), prompting us to explore this within a longitudinal cohort of patients recruited to investigate the role of depression in patients on General Practice (GP) CHD registers (10). This short report presents initial findings on the prevalence and characteristics of people with CHD and low health literacy.

Method

The design, recruitment, power calculation, and measures used in the Up-

1
2
3 Beat cohort study are described elsewhere (10). The study was granted
4 ethical approval by the Bexley and Greenwich Research Ethics Committee
5 (REC Reference: 07/H0809/38) (10). Health literacy was measured using the
6 Rapid Estimate of Health Literacy in Medicine (REALM) (11), a 66-item health
7 word pronunciation test highly correlated with other measures of health
8 literacy (12, 13) and widely used in research studies (3). The version of the
9 REALM validated for use in the UK was used. This groups people into 'low'
10 and 'adequate' health literacy with people with a score of < 59 out of the
11 possible 66 being considered to have low health literacy (14).
12
13
14
15
16
17
18

19
20 Study design. A cross-sectional analysis of baseline data from the Up-Beat
21 UK Cohort Study (10).
22
23

24 Statistical Analysis

25
26 Initial exploratory univariable analysis was undertaken to identify factors
27 independently associated with low health literacy using χ^2 tests (categorical
28 variables) and t-tests (continuous variables). Multivariable regression analysis
29 was then undertaken to identify those factors that remained significant when
30 all those identified in the univariable analysis were considered together.
31 Those characteristics where there was a statistically significant ($p < 0.05$) or
32 borderline significant difference between people with low and adequate health
33 literacy were entered into the multivariable model; logistic regression was
34 used to model predictors of low health literacy. The fit for the model was
35 assessed by the C statistic (ROC curve) and the Hosmer-Lemeshow
36 goodness of fit χ^2 test.
37
38
39
40
41
42
43
44
45

46 Analyses were performed using Stata version 11.2.
47
48

49 **Results**

50
51
52 Cohort characteristics are detailed elsewhere (10). Cohort recruitment and a
53 study flow diagram are shown in figure 1.
54
55
56
57

58 *Figure about here.*
59
60

The results of the univariable and multivariable analyses are shown in table 1.

Table: Characteristics by Health Literacy

		Health Literacy		Univariable analysis	Multivariable analysis
		Adequate	Low		
		N (%)	N (%)	N=687	N=659
Total		581 (84.57)	106 (15.43)		
				P-value ⁽¹⁾	Adjusted odds of having low health literacy (p-values)
Socio-demographic characteristics					
Gender	Male	397 (68.33)	87 (82.08)	0.004	0.32 (<0.001)
	Female	184 (31.67)	19 (17.92)		
Ethnicity	White	524 (90.19)	81 (76.42)	<0.001	3.12 (<0.001)
	Other	57 (9.81)	25 (23.58)		
Age, Mean (SD)	Years	71.14 (10.41)	68.92 (11.84)	0.049	1.00 (0.873)
Index of Multiple Deprivation score, Mean (SD)	Range 0-100	18.34 (13.84)	24.37 (13.24)	<0.001	1.02 (0.072)
Time in education, Mean (SD)	Years	12.01 (3.40)	10.92 (2.46)	<0.001 ⁽²⁾	0.84 (0.001)
Employment status	Unemployed/student	14 (2.42)	10 (9.52)	0.001	0.138
	Paid employment	117 (20.21)	18 (17.14)		
	Retired/Housewife	448 (77.37)	77 (73.33)		
Lifestyle Characteristics					
Alcohol intake (Units)	Doesn't drink	136 (23.45)	44 (41.90)	0.001	0.002
	1-10 units	289 (49.83)	44 (41.90)		
	11-20 units	87 (15.00)	9 (8.57)		
	Greater than 21 units	68 (11.72)	8 (7.62)		
BMI	Underweight/Normal	145 (25.62)	15 (14.29)	0.024	0.027
	Overweight	250 (44.17)	48 (45.71)		
	Obese	171 (30.21)	42 (40.00)		
Mental Health					
Depression score, Mean (SD)		2.86 (3.14)	4.28 (3.76)	<0.001 ⁽²⁾	
Anxiety score, Mean (SD)		4.39 (4.13)	6.35 (5.18)	<0.001 ⁽²⁾	1.08 (0.002)
Health utilisation in the 6 months prior to baseline					
Number of practice nurse visits, Mean (SD)		0.89 (1.85)	1.33 (2.21)	0.008 ⁽³⁾	
Duration of practice nurse visit, Mean (SD)		4.98 (7.05)	6.98 (8.30)	0.008 ⁽³⁾	
All other service use variables ⁽⁴⁾				0.120 ⁽⁵⁾ 0.793 ⁽⁶⁾	
¹ P-value from t-test for continuous variables and chi-squared tests for categorical variables					
² Unequal variances t-test used					
³ Wilcoxon rank sum test					
⁴ Number of Accident and Emergency visits, Day hospital and in-patient admissions (days), outpatient visits, GP visits (number, duration), district nurse visits (number, duration), other medical visits (number, duration), other care based visits (number, duration), informal care visits number.					
⁵ Number of Accident and Emergency visits					
⁶ Other care based visits (duration)					

1
2
3
4 Of the 803 cohort participants 687 (85.55%) completed the REALM
5 questionnaire. The 116 non-responders were excluded from the analyses.
6 Non-responders lived in more socio-economically deprived areas and had
7 received fewer years of education than those who completed the REALM.
8 There was no difference in ethnicity (responders vs. non-responders).
9
10
11
12

13
14 Of the 687 participants who completed the REALM, 106 (15.43%) had low
15 health literacy. For the multivariable analysis 28 patients could not be included
16 due to missing predictor variable data, leaving a total sample of 659.
17
18
19

20
21 Exploratory univariable analyses showed that people with low health literacy
22 were more likely to be male, from a non-white ethnic group, live in a more
23 deprived area, have spent fewer years in education, and were less likely to be
24 employed. Age was borderline significant with people with low health literacy
25 being slightly younger than people with adequate health literacy (difference in
26 mean age between groups 2.22 years).
27
28
29
30
31

32 The variables remaining in the final multivariable model were age, gender,
33 ethnicity (white versus other), IMD score, years of education, employment;
34 BMI and alcohol intake, and anxiety scores (Hospital Anxiety and Depression
35 Scale (HADS)) (15). There was an 8% increase in the odds of low health
36 literacy for every single unit increase in the anxiety score on HADS (range 0-
37 21).
38
39
40
41
42
43

44 Service use analysis (univariable only) showed that people with low health
45 literacy had significantly more, and longer, GP practice nurse consultations
46 than people with adequate health literacy, but other service use showed no
47 differences between groups.
48
49
50
51

52 **Discussion**

53 *Key findings*

54
55 This study confirms that the characteristics of patients with low health literacy
56 on UK GP CHD registers are similar to those seen in other long-term
57
58
59
60

1
2
3 conditions in studies undertaken in other industrialised countries (i.e.,
4 membership of a minority ethnic group, socio-economic deprivation, fewer
5 years in education, and lower income (9)). In contrast to other studies (3-6),
6 the patients with low health literacy in our study were slightly younger than the
7 patients with adequate health literacy, although the difference between groups
8 was small and should be interpreted with caution. We found the prevalence
9 of low health literacy to be close to that predicted from national general
10 literacy levels (7).

11
12
13
14
15
16
17
18 In addition people on GP CHD registers who have higher anxiety levels are
19 more likely to have low health literacy than people with lower anxiety levels.
20 This persists in the multivariable model, indicating an association over and
21 above that already known to exist between anxiety and low socio-economic
22 status (16, 17). This may reflect the findings of Ussher et al that CHD patients
23 with low health literacy have increased difficulty understanding information,
24 less knowledge of heart problems, and increased discomfort about asking for
25 explanations (18). The finding in the univariable analysis that patients with low
26 health literacy had more contact with practice nurses but not with other health
27 services requires further investigation.
28
29
30
31
32
33
34
35

36 *Study limitations*

37
38 As a cross-sectional study this project cannot demonstrate causality or the
39 impact of low health literacy over time.
40
41
42

43 Our findings may underestimate of the true picture; the 14.45% of participants
44 who declined to do the REALM share the characteristics of people with low
45 health literacy and may have declined because of reading difficulties.
46
47
48

49 Our findings of more frequent, and longer, GP practice nurse consultations
50 should be interpreted with caution, as this was found during univariable
51 analysis with no other factors controlled for; no service use data were entered
52 into the multivariable model. The above preliminary finding thus requires more
53 detailed health economic analysis and interpretation.
54
55
56
57
58
59
60

1
2
3 Finally, the REALM, although highly correlated with tests of functional health
4 and general literacy, is not itself a test of functional skills but of pronunciation.
5
6
7

8 *Summary*

9
10 Our findings indicate that there is a disadvantaged group of people on GP
11 CHD registers who have low health literacy in addition to other socio-
12 demographic barriers to health. A new finding is that these people have
13 significantly higher anxiety levels than people with adequate health literacy.
14
15
16

17 *Next steps*

18
19 Our possible finding that people on GP CHD registers with lower health
20 literacy consulted practice nurses more frequently will inform future Up-Beat
21 pilot interventions (10) and our longitudinal cohort data will enable us to
22 explore the impact of low health literacy on patients on GP CHD registers, and
23 on their health service use.
24
25
26
27
28

29 **Acknowledgements**

30
31 Many thanks to the 16 South London practices who participated in the
32 UPBEAT-UK study.
33
34
35

36
37 This report/article presents independent research commissioned by the
38 National Institute for Health Research (NIHR) under its Programme Grants for
39 Applied Research scheme (RP-PG-0606-1048). The views expressed in this
40 publication are those of the author(s) and not necessarily those of the NHS,
41 the NIHR or the Department of Health.
42
43
44

45
46 AT is partly employed by the NIHR Institute of Psychiatry and South London
47 and Maudsley Foundation Trust Mental Health Biomedical Research Centre.
48
49
50

51 **Data Sharing Statement**

52
53 There are no additional unpublished data from this study.
54

55 **Funding**

56
57 None
58
59
60

References

1. Health Literacy: A Prescription to End Confusion. Washington DC: Institute of Medicine, 2004.
2. 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.
3. Paasche-Orlow MK, Parker RM, Gazmararian JA, et al. The prevalence of limited health literacy. *J Gen Intern Med.* 2005;20(2):175-84. Epub 2005/04/20.
4. Rudd RE. Health literacy skills of U.S. adults. *Am J Health Behav.* 2007;31 Suppl 1:S8-18. Epub 2007/10/20.
5. Rootman I, Gordon-EI-Bihbety D. A Vision for a Health Literate Canada. Report of the Expert Panel on Health Literacy. Ottawa: Canadian Public Health Association, 2008.
6. Doyle G, Cafferkey K, Fullam J. European Health Literacy Survey (HLS-EU) Executive Summary. Dublin: University College Dublin, 2012.
7. Skills for Life Survey: Headline Findings. Department for Business Innovations and Skills 2011 Research report No.: 57.
8. Moser C. A fresh start: the report of the working party on literacy and numeracy. Department for Education and Employment, 1999.
9. Wolf MS, Gazmararian JA, Baker DW. Health literacy and functional health status in older adults. *Arch Int Med.* 2005;165:1946-52.
10. Tylee A, Ashworth M, Barley E, et al. Up-Beat UK: A programme of research into the relationship between coronary heart disease and depression in primary care patients. *BMC Family Practice* 2011;12(38) doi:10.1186/1471-2296-12-38.
11. Davis TC, Long SW, Jackson RH, et al. Rapid Estimate of Adult Literacy in Medicine: A Shortened Screening Instrument. *Family Medicine.* 1993;25(6):391-5.
12. Parker RM, Baker DW, Williams MV, et al. The Test of Functional Health Literacy in Adults (TOFHLA): a new instrument for measuring patients' literacy skills. *J Gen Intern Med.* 1995;10:537-42.

- 1
2
3 13. Weiss BD, Mays MZ, Martz W, et al. Quick assessment of literacy in
4 primary care: the newest vital sign. *Ann Fam Med*. 2005;3(6):514-22. Epub
5 2005/12/13.
6
- 7
8 14. Ibrahim SY, Reid F, Shaw A, et al. Validation of a health literacy
9 screening tool (REALM) in a UK population with coronary heart disease. *J*
10 *Public Health (Oxf)*. 2008;30(4):449-55. Epub 2008/07/29.
11
- 12
13 15. Hamilton M. Development of a rating scale for primary depressive
14 illness. *Br J Soc Clin Psychol*. 1967;6(4):278-96. Epub 1967/12/01.
15
- 16
17 16. Wolff BC, Santiago CD, Wadsworth ME. Poverty and involuntary
18 engagement stress responses: examining the link to anxiety and aggression
19 within low-income families. *Anxiety Stress Coping*. 2009;22(3):309-25. Epub
20 2009/03/03.
21
- 22
23 17. Najman JM, Hayatbakhsh MR, Clavarino A, et al. Family poverty over
24 the early life course and recurrent adolescent and young adult anxiety and
25 depression: a longitudinal study. *Am J Public Health*. 2010;100(9):1719-23.
26
27 Epub 2010/07/17.
28
- 29
30 18. Ussher M, Ibrahim S, Reid F, et al. Psychosocial correlates of health
31 literacy among older patients with coronary heart disease. *J Health Commun*.
32 2010;15(7):788-804. Epub 2010/11/26.
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

1
2
3 **Characteristics of people with low health literacy on coronary heart**
4 **disease GP registers in South London**

5
6 **Lead, corresponding author and paper guarantor**

7
8 **Gill Rowlands¹**

9
10 Professor of Health Disparities

11 Faculty of Health and Social Care

12 London South Bank University

13 London SE1 0AA

14 rowlang2@lsbu.ac.uk
15
16
17
18
19

20 **Co-authors**

21 **Anita Mehay²** BSc (Hons) MSc. Research Assistant

22 **Sally Hampshire¹** BSc MSc Research Assistant

23 **Rachel Phillips²** BSc MSc GradStat. Research Fellow

24 **Paul Williams²** BSc MPH. Statistician.

25 **Anthony Mann²** MD FRCP FRCPsych. Emeritus Professor

26 **Andrew Steptoe³** BA MA DPhil DSC. British Heart Foundation Professor of
27 Psychology

28 **Paul Walters²** PhD MRCPsych. Research Fellow

29 **Andre Tylee²** MD FRCGP MRCPsych. Head, Section of Primary Care Mental
30 Health
31
32

33
34
35 **Word count: abstract 300 words, main text 1303 words.**
36
37
38
39

40
41
42 **Study design:** cross-sectional survey
43
44
45

46 **Statements:** The Corresponding Author has the right to grant on behalf of all
47 authors and does grant on behalf of all authors, an exclusive licence (or non
48 exclusive for government employees) on a worldwide basis to the BMJ
49 Publishing Group Ltd to permit this article (if accepted) to be published in BMJ
50 editions and any other BMJ PGL products and sublicences such use and
51
52
53
54

55
56 ¹ London South Bank University

57 ² Institute of Psychiatry, Kings College London

58 ³ University College London
59
60

1
2
3 exploit all subsidiary rights, as set out in their licence.
4
5

6 Competing interests: AT is partly employed by the NIHR Institute of Psychiatry
7 and South London and Maudsley Foundation Trust Mental Health Biomedical
8 Research Centre.
9
10

11
12 All authors have completed the Unified Competing Interest form
13 **at**www.icmje.org/coi_disclosure.pdf (available on request from the
14 corresponding author) and declare: no support from any organisation for the
15 submitted work, no financial relationships with any organisations that might
16 have an interest in the submitted work in the previous three years, no other
17 relationships or activities that could appear to have influenced the submitted
18 work.
19
20
21
22
23

24 **Contributions:**

25
26 GR Led on development of the research idea, contributed to interpretation of
27 result, and led on writing the paper
28

29 AM collected research data and contributed to interpretation of results and
30 writing the paper
31

32 SH collected research data and contributed to interpretation of results and
33 writing the paper
34

35 RP led on statistical analysis of the data and interpretation of the results
36

37 PW conducted additional statistical analysis and contributed to the paper
38

39 AM co-developed the UPBEAT cohort study in which the study is sited,
40 contributed to the research idea, contributed to interpretation of results and
41 writing the paper
42
43

44 AS contributed to the project design, analysis of results and writing the paper
45

46 PW contributed to the research idea, interpretation of the results and writing
47 the paper
48

49 AT led on the development of the UPBEAT cohort study in which the study is
50 sited, contributed to the research idea, contributed to interpretation of results
51 and writing the paper.
52
53
54

55
56 All authors have approved the final version
57
58
59
60

Abstract (299 words)

Objective. To explore characteristics associated with, and prevalence of, low health literacy in patients recruited to investigate the role of depression in patients on General Practice (GP) Coronary Heart Disease (CHD) registers (the Up-Beat UK study).

Design. Cross-sectional cohort. The health literacy measure was the Rapid Estimate of Health Literacy in Medicine (REALM). Univariable analyses identified characteristics associated with low health literacy and compared health service use between health literacy statuses. Those variables where there was a statistically significant/borderline significant difference between health literacy statuses were entered into a multivariable model.

Setting. 16 general practices in south London, UK.

Participants: Inclusion: patients >18 years, registered with a GP and on a GP CHD register. Exclusion: patients temporarily registered.

Primary outcome measure: REALM.

Results. Of the 803 Up-Beat cohort participants, 687 (85.55%) completed the REALM of whom 106 (15.43%) had low health literacy. **Twenty-eight participants could not be included in the multivariable analysis due to missing predictor variable data, leaving a sample of 659.** The variables remaining in the final model were age, gender, ethnicity, IMD score, years of education, employment; BMI and alcohol intake, and anxiety scores (Hospital Anxiety and Depression Scale (HADS)). Univariable analysis also showed that people with low health literacy may have more, and longer, practice nurse consultations than people with adequate health literacy.

Conclusions. There is a disadvantaged group of people on GP CHD registers with low health literacy. The multivariable model showed that patients with low health literacy have significantly higher anxiety levels than people with adequate health literacy. In addition, the univariable analyses show that such patients have more, and longer, consultations with practice nurses. We will collect 4-year longitudinal cohort data to explore the impact of health literacy in people on GP CHD registers and the impact of health literacy on health service use.

Article summary

Article focus

- Identifying the prevalence and characteristics of people with CHD and low health literacy on coronary heart disease GP registers in South London, UK

Key Messages

- The characteristics of patients with low health literacy on UK GP CHD registers are similar to those seen in other long-term conditions in studies undertaken in other industrialised countries
- The prevalence of low health literacy to be close to that predicted from national general literacy levels at 15%
- People on GP CHD registers who have higher anxiety levels are more likely to have low health literacy than people with lower anxiety levels

Strengths

- The data were collected within a prospective cohort study
- There were a wide range of sociodemographic data collected enabling characteristics of patients with low health literacy to be described
- The simultaneous collection of psychological and service use data enabled these to be compared between patients with low and adequate health literacy

Limitations

- As a cross-sectional study this project cannot demonstrate causality or the impact of low health literacy over time.
- The findings may underestimate of the true picture; the participants who declined to do the REALM may have declined because of reading difficulties.
- Our findings of more frequent, and longer, GP practice nurse consultations should be interpreted with caution; the above preliminary finding requires more detailed health economic analysis and interpretation
- The REALM, although highly correlated with tests of functional health and general literacy, is not itself a test of functional skills but of pronunciation

Introduction

Health literacy, 'the cognitive and social skills that determine the motivation and ability of individuals to (access), understand and use information in ways that promote and maintain good health' (1) is a social determinant of health (2). Whilst associated with other social determinants e.g. ethnicity, income, education, and socio-demographic status (SES), it has an independent association with poor health (3). **International comparisons of health literacy levels are hampered by differing national definitions; however it is clear that health literacy is an important issue in many industrialised nations. The proportion of the population thought to be disadvantaged through low health literacy ranges from 19% in the US (4) to 55% in Canada (5). A recent survey of health literacy in Europe, where a common definition of health literacy was adopted, shows a range of health literacy skills between nations, with the proportion of the population having suboptimal health literacy skills ranging from 27.3% in the Netherlands to 61.4% in Bulgaria (6).** There are no data on health literacy levels in England; however the 2011 national skills survey has shown that 15% of the adult population (=5 million people) are 'functionally illiterate' (7) (i.e. have insufficient literacy skills to achieve their potential in life and society (8)). It is reasonable to assume that a similar proportion also have low health literacy.

Low health literacy has greatest impact in complex health conditions when patients have to understand procedures, manage medication, and attend multiple appointments. US studies have shown that adults with low health literacy have a higher prevalence of diabetes and heart failure, worse physical and mental health, and higher all-cause mortality (9). There is little research on low health literacy and coronary heart disease (CHD), prompting us to explore this within a longitudinal cohort of patients recruited to investigate the role of depression in patients on General Practice (GP) CHD registers (10). This short report presents initial findings on the prevalence and characteristics of people with CHD and low health literacy.

Method

The design, recruitment, power calculation, and measures used in the Up-

1
2
3 Beat cohort study are described elsewhere (10). The study was granted
4 ethical approval by the Bexley and Greenwich Research Ethics Committee
5 (REC Reference: 07/H0809/38) (10). Health literacy was measured using the
6 Rapid Estimate of Health Literacy in Medicine (REALM) (11), a 66-item health
7 word pronunciation test highly correlated with other measures of health
8 literacy (12, 13) and widely used in research studies (3). **The version of the**
9 **REALM validated for use in the UK was used. This groups people into 'low'**
10 **and 'adequate' health literacy with people with a score of < 59 out of the**
11 **possible 66 being considered to have low health literacy (14).**

12
13
14
15
16
17
18
19
20 Study design. A cross-sectional analysis of baseline data from the Up-Beat
21 UK Cohort Study (10).

22 23 24 Statistical Analysis

25 **Initial exploratory univariable analysis was undertaken to identify factors**
26 **independently associated with low health literacy using χ^2 tests (categorical**
27 **variables) and t-tests (continuous variables). Multivariable regression analysis**
28 **was then undertaken to identify those factors that remained significant when**
29 **all those identified in the univariable analysis were considered together.**
30 Those characteristics where there was a statistically significant ($p < 0.05$) or
31 borderline significant difference between people with low and adequate health
32 literacy were entered into the multivariable model; logistic regression was
33 used to model predictors of low health literacy. The fit for the model was
34 assessed by the C statistic (ROC curve) and the Hosmer-Lemeshow
35 goodness of fit χ^2 test.

36
37
38
39
40
41
42
43
44
45
46 Analyses were performed using Stata version 11.2.

47 48 49 **Results**

50
51
52
53 Cohort characteristics are detailed elsewhere (10). Cohort recruitment and a
54 study flow diagram are shown in figure 1.

55
56
57
58 *Figure about here.*

The results of the univariable and multivariable analyses are shown in table 1.

Table: Characteristics by Health Literacy

		Health Literacy			
		Adequate	Low		
		N (%)	N (%)	Univariable analysis	Multivariable analysis
Total		581 (84.57)	106 (15.43)	N=687	N=659
				P-value ⁽¹⁾	Adjusted odds of having low health literacy (p-values)
Socio-demographic characteristics					
Gender	Male	397 (68.33)	87 (82.08)	0.004	0.32 (<0.001)
	Female	184 (31.67)	19 (17.92)		
Ethnicity	White	524 (90.19)	81 (76.42)	<0.001	3.12 (<0.001)
	Other	57 (9.81)	25 (23.58)		
Age, Mean (SD)	Years	71.14 (10.41)	68.92 (11.84)	0.049	1.00 (0.873)
Index of Multiple Deprivation score, Mean (SD)	Range 0-100	18.34 (13.84)	24.37 (13.24)	<0.001	1.02 (0.072)
Time in education, Mean (SD)	Years	12.01 (3.40)	10.92 (2.46)	<0.001 ⁽²⁾	0.84 (0.001)
Employment status	Unemployed/student	14 (2.42)	10 (9.52)	0.001	0.138
	Paid employment	117 (20.21)	18 (17.14)		
	Retired/Housewife	448 (77.37)	77 (73.33)		
Lifestyle Characteristics					
Alcohol intake (Units)	Doesn't drink	136 (23.45)	44 (41.90)	0.001	0.002
	1-10 units	289 (49.83)	44 (41.90)		
	11-20 units	87 (15.00)	9 (8.57)		
	Greater than 21 units	68 (11.72)	8 (7.62)		
BMI	Underweight/Normal	145 (25.62)	15 (14.29)	0.024	0.027
	Overweight	250 (44.17)	48 (45.71)		
	Obese	171 (30.21)	42 (40.00)		
Mental Health					
Depression score, Mean (SD)		2.86 (3.14)	4.28 (3.76)	<0.001 ⁽²⁾	
Anxiety score, Mean (SD)		4.39 (4.13)	6.35 (5.18)	<0.001 ⁽²⁾	1.08 (0.002)
Health utilisation in the 6 months prior to baseline					
Number of practice nurse visits, Mean (SD)		0.89 (1.85)	1.33 (2.21)	0.008 ⁽³⁾	
Duration of practice nurse visit, Mean (SD)		4.98 (7.05)	6.98 (8.30)	0.008 ⁽³⁾	
All other service use variables ⁽⁴⁾				0.120 ⁽⁵⁾ - 0.793 ⁽⁶⁾	
¹ P-value from t-test for continuous variables and chi-squared tests for categorical variables					
² Unequal variances t-test used					
³ Wilcoxon rank sum test					
⁴ Number of Accident and Emergency visits, Day hospital and in-patient admissions (days), outpatient visits, GP visits (number, duration), district nurse visits (number, duration), other medical visits (number, duration), other care based visits (number, duration), informal care visits number.					
⁵ Number of Accident and Emergency visits					
⁶ Other care based visits (duration)					

1
2
3
4 Of the 803 cohort participants 687 (85.55%) completed the REALM
5 questionnaire. The 116 non-responders were excluded from the analyses.
6 Non-responders lived in more socio-economically deprived areas and had
7 received fewer years of education than those who completed the REALM.
8 There was no difference in ethnicity (responders vs. non-responders).
9

10
11
12
13
14 Of the 687 participants who completed the REALM, 106 (15.43%) had low
15 health literacy. For the multivariable analysis 28 patients could not be included
16 due to missing predictor variable data, leaving a total sample of 659.
17
18

19
20 Exploratory univariable analyses showed that people with low health literacy
21 were more likely to be male, from a non-white ethnic group, live in a more
22 deprived area, have spent fewer years in education, and were less likely to be
23 employed. Age was borderline significant with people with low health literacy
24 being slightly younger than people with adequate health literacy (difference in
25 mean age between groups 2.22 years).
26
27
28
29

30
31
32 The variables remaining in the final multivariable model were age, gender,
33 ethnicity (white versus other), IMD score, years of education, employment;
34 BMI and alcohol intake, and anxiety scores (Hospital Anxiety and Depression
35 Scale (HADS)) (15). There was an 8% increase in the odds of low health
36 literacy for every single unit increase in the anxiety score on HADS (range 0-
37 21).
38
39
40
41
42

43
44 Service use analysis (univariable only) showed that people with low health
45 literacy had significantly more, and longer, GP practice nurse consultations
46 than people with adequate health literacy, but other service use showed no
47 differences between groups.
48
49

50 51 **Discussion**

52 *Key findings*

53
54 This study confirms that the characteristics of patients with low health literacy
55 on UK GP CHD registers are similar to those seen in other long-term
56
57
58
59
60

1
2
3 conditions in studies undertaken in other industrialised countries (i.e.,
4 membership of a minority ethnic group, socio-economic deprivation, fewer
5 years in education, and lower income (9)). In contrast to other studies (3-6),
6 the patients with low health literacy in our study were slightly younger than the
7 patients with adequate health literacy, although the difference between groups
8 was small and should be interpreted with caution. We found the prevalence
9 of low health literacy to be close to that predicted from national general
10 literacy levels (7).

11
12
13
14
15
16
17
18 In addition people on GP CHD registers who have higher anxiety levels are
19 more likely to have low health literacy than people with lower anxiety levels.
20 This persists in the multivariable model, indicating an association over and
21 above that already known to exist between anxiety and low socio-economic
22 status (16, 17). This may reflect the findings of Ussher et al that CHD patients
23 with low health literacy have increased difficulty understanding information,
24 less knowledge of heart problems, and increased discomfort about asking for
25 explanations (18). The finding in the univariable analysis that patients with low
26 health literacy had more contact with practice nurses but not with other health
27 services requires further investigation.

28 29 30 31 32 33 34 35 36 *Study limitations*

37 As a cross-sectional study this project cannot demonstrate causality or the
38 impact of low health literacy over time.

39
40
41
42
43 Our findings may underestimate of the true picture; the 14.45% of participants
44 who declined to do the REALM share the characteristics of people with low
45 health literacy and may have declined because of reading difficulties.

46
47
48
49
50 Our findings of more frequent, and longer, GP practice nurse consultations
51 should be interpreted with caution, as this was found during univariable
52 analysis with no other factors controlled for; no service use data were entered
53 into the multivariable model. The above preliminary finding thus requires more
54 detailed health economic analysis and interpretation.

1
2
3 Finally, the REALM, although highly correlated with tests of functional health
4 and general literacy, is not itself a test of functional skills but of pronunciation.
5
6
7

8 *Summary*

9
10 Our findings indicate that there is a disadvantaged group of people on GP
11 CHD registers who have low health literacy in addition to other socio-
12 demographic barriers to health. A new finding is that these people have
13 significantly higher anxiety levels than people with adequate health literacy.
14
15
16

17 *Next steps*

18
19 Our possible finding that people on GP CHD registers with lower health
20 literacy consulted practice nurses more frequently will inform future Up-Beat
21 pilot interventions (10) and our longitudinal cohort data will enable us to
22 explore the impact of low health literacy on patients on GP CHD registers, and
23 on their health service use.
24
25
26
27
28

29 **Acknowledgements**

30
31 Many thanks to the 16 South London practices who participated in the
32 UPBEAT-UK study.
33
34
35

36
37 This report/article presents independent research commissioned by the
38 National Institute for Health Research (NIHR) under its Programme Grants for
39 Applied Research scheme (RP-PG-0606-1048). The views expressed in this
40 publication are those of the author(s) and not necessarily those of the NHS,
41 the NIHR or the Department of Health.
42
43
44
45

46
47 AT is partly employed by the NIHR Institute of Psychiatry and South London
48 and Maudsley Foundation Trust Mental Health Biomedical Research Centre.
49
50
51
52
53
54
55
56
57
58
59
60

References

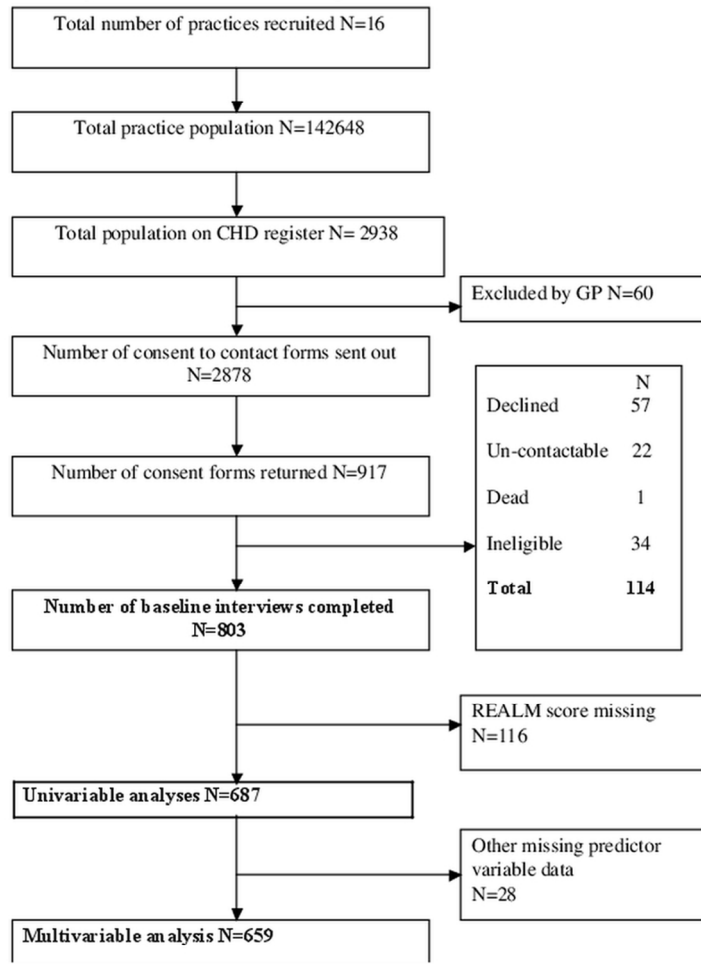
1. Health Literacy: A Prescription to End Confusion. Washington DC: Institute of Medicine, 2004.
2. CSDH. Closing the gap in a generation: health equity through action on the social determinants of health. Final Report of the Commission on Social Determinants of Health. Geneva: World Health Organization, 2008.
3. Paasche-Orlow MK, Parker RM, Gazmararian JA, Nielsen-Bohlman LT, Rudd RR. The prevalence of limited health literacy. *J Gen Intern Med.* 2005;20(2):175-84. Epub 2005/04/20.
4. Rudd RE. Health literacy skills of U.S. adults. *Am J Health Behav.* 2007;31 Suppl 1:S8-18. Epub 2007/10/20.
5. Rootman I, Gordon-EI-Bihbety D. A Vision for a Health Literate Canada. Report of the Expert Panel on Health Literacy. Ottawa: Canadian Public Health Association, 2008.
6. Doyle G, Cafferkey K, Fullam J. European Health Literacy Survey (HLS-EU) Executive Summary. Dublin: University College Dublin, 2012.
7. Skills for Life Survey: Headline Findings. Department for Business Innovations and Skills 2011 Research report No.: 57.
8. Moser C. A fresh start: the report of the working party on literacy and numeracy. Department for Education and Employment, 1999.
9. Wolf MS, Gazmararian JA, Baker DW. Health literacy and functional health status in older adults. *Arch Int Med.* 2005;165:1946-52.
10. Tylee A, Ashworth M, Barley E, Brown J, Chambers J, Farmer A, et al. Up-Beat UK: A programme of research into the relationship between coronary heart disease and depression in primary care patients. *BMC Family Practice* 2011;12(38) doi:10.1186/1471-2296-12-38.
11. Davis TC, Long SW, Jackson RH, Mayeaux EJ, George RB, Murphy PW, et al. Rapid Estimate of Adult Literacy in Medicine: A Shortened Screening Instrument. *Family Medicine.* 1993;25(6):391-5.
12. Parker RM, Baker DW, Williams MV, Nurss JR. The Test of Functional Health Literacy in Adults (TOFHLA): a new instrument for measuring patients' literacy skills. *J Gen Intern Med.* 1995;10:537-42.

- 1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
13. Weiss BD, Mays MZ, Martz W, Castro KM, DeWalt DA, Pignone MP, et al. Quick assessment of literacy in primary care: the newest vital sign. *Ann Fam Med*. 2005;3(6):514-22. Epub 2005/12/13.
14. Ibrahim SY, Reid F, Shaw A, Rowlands G, Gomez GB, Chesnokov M, et al. Validation of a health literacy screening tool (REALM) in a UK population with coronary heart disease. *J Public Health (Oxf)*. 2008;30(4):449-55. Epub 2008/07/29.
15. Hamilton M. Development of a rating scale for primary depressive illness. *Br J Soc Clin Psychol*. 1967;6(4):278-96. Epub 1967/12/01.
16. Wolff BC, Santiago CD, Wadsworth ME. Poverty and involuntary engagement stress responses: examining the link to anxiety and aggression within low-income families. *Anxiety Stress Coping*. 2009;22(3):309-25. Epub 2009/03/03.
17. Najman JM, Hayatbakhsh MR, Clavarino A, Bor W, O'Callaghan MJ, Williams GM. Family poverty over the early life course and recurrent adolescent and young adult anxiety and depression: a longitudinal study. *Am J Public Health*. 2010;100(9):1719-23. Epub 2010/07/17.
18. Ussher M, Ibrahim S, Reid F, Shaw A, Rowlands G. Psychosocial correlates of health literacy among older patients with coronary heart disease. *J Health Commun*. 2010;15(7):788-804. Epub 2010/11/26.

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Exploring indicators of low health literacy in a cohort with symptomatic Coronary Heart Disease

Figure: Study recruitment: Consort diagram



90x125mm (300 x 300 DPI)