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Public awareness of and responses to media coverage of invitation errors in the Breast Screening Programme in England: A population survey

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19 **Authors:**

20
21 Alex Ghanouni^a a.ghanouni@ucl.ac.uk
22

23
24 Christian von Wagner^a c.wagner@ucl.ac.uk
25

26
27 Jo Waller^{ab} j.waller@ucl.ac.uk | Tel: +44 (0)20 7679 5958 | Fax: +44 (0)20 7679 8354
28
29

30
31
32 **Affiliations:**
33

34
35 ^aResearch Department of Behavioural Science and Health, University College London, Gower Street,
36
37 London, WC1E 6BT, United Kingdom
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40 ^bCorresponding author
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ABSTRACT

Objectives: In May 2018, the British Health Secretary announced the 'serious failure' that 450,000 women had missed out on invitations to breast screening in England, leading to extensive media coverage. This study measured public awareness of the story and tested for associated factors (e.g. educational level and trust in the NHS).

Design: A computer-assisted face-to-face survey in June 2018.

Setting: Participants completed the survey in their homes.

Participants: Males and females aged 16 years or older in England.

Primary and secondary outcome measures: Awareness of aspects of the media coverage and reported statistics. Other data included demographics (e.g. ethnicity), awareness of unrelated contemporaneous news stories, trust in participants' GPs and the NHS, and (among women) worry about breast cancer and future breast screening intentions.

Results: Descriptive statistics showed that 66.7% of 1,894 participants reported being aware of the media coverage. Regression analyses showed that those who were aware of other news stories, were white British, and had a higher level of education or social class grade were more likely to be aware. In contrast, only 36.0% correctly identified at least one of two headline statistics. This study did not find evidence that awareness was negatively associated with trust in participants' GPs or the NHS, breast cancer worry or future breast cancer screening intentions.

Conclusions: Awareness of the breast screening news story was high but recall of reported statistics was much lower: the public may have retained only the gist of quantitative information. Associations between story awareness and attitudes or behaviour were not apparent.

Keywords: Breast imaging; Journalism; Organisation of health services; Public Health

Strengths and limitations of this study:

- This study builds on previous research on media coverage around public health concerns by measuring levels of awareness among the general public and testing for characteristics associated with awareness.
- The survey was carried out shortly after media coverage of the announcement began, when awareness and knowledge were likely to be at their highest.
- Associations between awareness of media coverage and e.g. greater worry about breast cancer and lower trust in the NHS were not apparent but Type II error cannot be excluded.
- Tests for associations between awareness of media coverage and screening behaviour were based on intended future uptake; actual uptake may differ.

INTRODUCTION

On 2nd May 2018, the Health Secretary in Great Britain, Jeremy Hunt, made an unanticipated statement to the House of Commons regarding *"a serious failure...in the national Breast Screening Programme"*. Mr Hunt stated that since 2009, *"a computer algorithm failure"* had resulted in approximately 450,000 women not being invited to their final regular breast screening appointment (i.e. when they were aged 68 to 71 years). He indicated to the House that *"[the] current best estimate based on statistical modelling...is that there may be between 135 and 270 women who had their lives shortened as a result"* and that women affected *"will automatically be sent an invitation to a catch-up screening"*.¹

News of this statement was reported extensively in the national media (e.g. ²⁻⁴). Previous research has found that media coverage of cancer-related stories in the United Kingdom has appreciable public health implications. For example, there is evidence that the cervical cancer diagnosis and death of a young female celebrity, Jade Goody, influenced women's cervical cancer screening decisions and temporarily increased uptake and diagnoses of high-grade cervical neoplasia.⁵⁻⁸ Similarly, uptake of the colorectal screening programme increased following coverage of the United Kingdom Flexible Sigmoidoscopy Screening Trial.⁹⁻¹⁰ Comparable findings have been reported by studies of pre-planned media messages such as Public Health England's 'Be Clear on Cancer' campaigns, which

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3 aim to increase cancer symptom awareness. These were associated with an increase in symptomatic
4 attendance at General Practices and referrals to secondary care.¹¹⁻¹³
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8 In these cases, media coverage was associated with an increase in healthcare usage. However,
9 news about an error in the screening programme may have had adverse effects (e.g. diminishing trust
10 in the National Health Service). This presumes a nominal level of public awareness about the news
11 story; it is unclear to what extent such health stories reach the general public and whether the public
12 retains key information.
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18 This study surveyed public awareness of the story and knowledge about the relevant statistics (i.e.
19 the number of women estimated to have missed an invitation and to have had their lives shortened)
20 shortly after the announcement. We also conducted an exploratory analysis of variables associated
21 with awareness of the media coverage, including education, gender, and awareness of other news
22 stories that were reported around the same time. We also tested the hypotheses that awareness of
23 the breast screening media coverage would be associated with lower trust in participants' GPs and
24 the NHS and (in women) more frequent worry about breast cancer and being less likely to intend to
25 participate in breast screening.
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34 **METHODS**

35 **Design**

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37 Institutional ethical approval was obtained (registration number: 2951/006). A market research agency
38 (Kantar TNS UK) collected data in two waves of sampling between 6th and 10th June 2018 (i.e. less
39 than six weeks after the initial news story. The survey questions formed one module within a weekly
40 face-to-face computer-assisted omnibus survey on a wider range of topics. Random location sampling
41 was used to identify target households based on the 2011 Census and Postcode Address File. At
42 each location, quotas were set with the aim of achieving national representativeness based on
43 working status, children in the household, gender, and age.
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54 The full survey is included in Appendix 1. Participants were initially shown a computer screen with text
55 introducing the study and asking for their consent to participate. They were also given an information
56 card containing debrief text and directions to further information about breast screening.
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Participants

Eligible participants were all males and females in England aged 16 years or older who consented to take part in this module of the survey. The sample includes women eligible for breast screening (i.e. aged 47 to 73 years) and also members of the general population (males and females aged 16 years or older) since it was hypothesised that awareness of the story had the potential to negatively affect perceptions of other health services, irrespective of whether participants were affected directly.

Measures

Demographics:

General background information included participants' self-reported age (in years), gender, ethnic origin, marital status, education, social class grade,¹⁴ employment status, and urban or rural area type.

Cancer and breast screening experience, and attitudes towards screening:

Participants were asked whether they had been diagnosed with any of several types of cancer themselves. Women aged 47 years or older were also asked if they had ever been i) invited to and ii) participated in the Breast Screening Programme.

Participants were asked about their attitudes towards screening via a previously used question,¹⁵ "*routine screening means testing healthy people to find cancer before they have any symptoms. Do you think routine cancer screening tests for healthy people are almost always a good idea?*".

Response options were "yes", "no", and "not sure".

Awareness of the breast screening news story:

Participants were asked to read a brief summary of the story (see Appendix 1, Q7), the main details of which were derived from the primary story on the topic on the BBC news website.⁴ This was followed by the question, "*do you recall seeing or hearing anything about this news story before now?*".

Response options were "yes", "no", and "not sure".

It was anticipated that directions of associations with awareness may depend on the specific parts of the story of which participants were aware. For example, follow-up commentaries on the main news

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3 story argued that breast screening has no effect on all-cause mortality and results in overdiagnosis,
4 which may have mitigated worry about screening errors. Consequently, participants who reported
5 being aware of the main news story were also asked about their awareness of further reporting using
6 two further summaries (see Appendix 1, Q14 and Q15), derived from two sources.¹⁶⁻¹⁷
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11 Questions for assessing awareness were the same as previous. Participants reporting awareness of
12 the news story were also asked where they saw or heard it and whether they discussed or shared it
13 with anyone else. They were also asked two questions on the key statistics reported based on the
14 following summaries:
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20 *“The Health Secretary, Jeremy Hunt, gave an estimate of the number of women who had failed to get*
21 *invitations since 2009.”*
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25 *“The Health Secretary also gave an estimate, based on computer modelling, of the number of women*
26 *who may have had their lives shortened.”*
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29 For both, the question was *“which of the following do you think is the estimate that he gave?”*. For the
30 first question, response options consisted of the true estimate (450,000) and three alternatives that
31 were orders of magnitude higher or lower (4,500, 45,000, and 4,500,000). Similarly, response options
32 for the second question consisted of the correct answer (between 135 and 270) and alternatives that
33 were either an order of magnitude higher (1,350 and 2,700), lower (13 and 27), or both higher and
34 lower (13 and 2,700). Response order was presented in one of two different ways for each participant
35 (determined at random) to reduce potential order effects.
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43 Awareness of news stories unrelated to breast screening:
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46 Awareness of other news stories was measured by asking participants to read two further summaries
47 (one on a volcano eruption in Hawaii; one on local council elections in England; see Appendix 1, Q19
48 and Q20). This was followed by the same measure of awareness as in previous questions. Main
49 details were derived from the primary stories on the BBC news website.¹⁸⁻¹⁹ These two stories were
50 selected for comparison because they were reported around the same time and also consisted of
51 specific, definable events.
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58 Trust in health services:
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3 Participants were asked two questions based on previously used items,²⁰ “*in general, how much do*
4 *you trust...*” i) “*...your general practitioner?*” and ii) “*...the NHS?*”. Response options for both were
5 “*not at all*”, “*a little*”, “*somewhat*”, “*a lot*”, and “*not sure*”.
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10 Frequency of breast cancer worry:

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12 Breast cancer worry (among women) was measured using an item based on one previously used,²¹
13 “*how often do you worry about your chances of getting breast cancer yourself?*”. Response options
14 were, “*never*”, “*occasionally*”, “*sometimes*”, “*often*”, “*very often*”, “*not sure*”, and “*prefer not to say*”.
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19 Breast screening intentions:

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21 Women aged 16 to 69 years were asked, “*do you think you will go for breast screening when you are*
22 *next offered it?*”. Response options were “*yes, definitely*”, “*yes, probably*”, “*no, probably not*”, and “*no,*
23 *definitely not*”.
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27 28 **Analysis**

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30 Participant characteristics and awareness about the news stories are reported using descriptive
31 statistics. Responses of “*prefer not to say*” were excluded, as were responses of “*not sure*” for ordinal
32 variables. Other responses of “*not sure*”, were grouped with “*no*”. Ethnicity was dichotomised into
33 “*white British*” and “*other groups*”; social class grades were grouped into “*A or B*”, “*C1*”, “*C2*”, and “*D*
34 *or E*”. For education, “*trade apprenticeships*” were grouped with “*other qualifications*”. Responses to
35 measures of invitations to and participation in breast screening were coded into “*not eligible or not*
36 *invited*”, “*invited, never taken part*”, and “*taken part*”.
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45 One exploratory regression model tested for variables potentially associated with whether people
46 responded to the survey. Three exploratory regression models tested for variables potentially
47 associated with i) awareness of the breast screening news; and stating correctly the number of
48 women who were ii) not invited for screening and iii) estimated to have had their lives shortened. A
49 further four regression models tested the null hypotheses that awareness of the breast screening
50 news story was not associated with trust in iv) participants’ GPs and v) the NHS in the whole sample;
51 and vi) frequency of worry about breast cancer and vii) intentions to participate in breast screening in
52 future among women aged 70 years or less, after adjusting for covariates.
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3 For the model assessing variables associated with responding to the questionnaire, the main
4 variables of interest were recruitment wave, gender, ethnicity, marital status, social class grade,
5 employment status, area type, and age (since these were the variables where data were available for
6 both participants and non-participants). For the four main exploratory models and hypothesis testing
7 models, independent variables were as above with the addition of other available measures (listed in
8 appended tables) where multi-collinearity was not an appreciable issue (i.e. Variance Inflation Factors
9 <10). Age was included in models as either a continuous variable or divided into age groups (where a
10 Box-Tidwell procedure found evidence that the assumption of linearity was not met; $p < .05$).
11 Frequency of worry about breast cancer was also included in the model of future breast screening
12 intentions.

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14 For models testing hypotheses, responses on measures of awareness of the breast screening story
15 were coded into a single nominal variable with five levels: 1) *“unaware of the story”*, 2) *“aware of the
16 main story only”*, 3) *“aware of the main story and all-cause mortality follow-up commentary”*, 4) *“aware
17 of the main story and overdiagnosis follow-up commentary”*, 5) *“aware of the main story and both
18 follow-up commentaries”*.

19 Ordinal logistic regression was attempted in the first instance where dependent variables were
20 ordinal. Tests of parallel lines suggested that the assumption of proportional odds was generally not
21 met ($p < .0005$). Hence, dependent variables were dichotomised and binary logistic regression was
22 used, except for the model testing associations with frequency of breast cancer worry where ordinal
23 logistic regression was appropriate. Participants with missing data on variables of interest were not
24 included in models.

25 RESULTS

26 Participant characteristics

27 2,681 participants began the survey module. 787 (29.4%) opted out, leaving 1,894 participants who
28 provided data. Mean age was 50.8 years (standard deviation: 20.5). Characteristics are described in
29 Appendix 2 (Table A). Response to the survey module questions was associated with all variables in
30 the model, except for area type (Appendix 2, Table B). Participants of the omnibus survey
31 approached were more likely to respond to this survey module if they were invited in wave 1 (vs. wave
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2), female (vs. male), white British (vs. other groups), married, living as a couple, or widowed, divorced or separated (vs. single), in higher social class grades (vs. grades D or E), working (vs. not working), and younger.

Awareness of news stories, sources of information, and variables associated with awareness of the breast screening media coverage

1,264/1,894 (66.7%) reported being aware of the main news story (Appendix 2, Table A) and relatively few reported being aware of follow-up commentaries: 438/1,264 (34.7%) and 367/1,264 (29.0%) recognised the commentaries on all-cause mortality and overdiagnosis, respectively. 250/1,264 (19.8%) were aware of both. 971/1,264 (76.8%) and 271/1,264 (21.4%) encountered the story on television and radio, respectively (participants could select more than one). 169/1,264 (13.4%) and 134/1,264 (10.6%) encountered the story in print newspapers and online news websites (Appendix 2, Table C). Other news sources were used relatively rarely e.g. 68/1,264 (5.4%) heard the story from social media websites. 450/1,264 (35.6%) reported discussing or sharing the story with someone else.

Participants were more likely to be aware of the story if they were aware of either of the other two news stories. Awareness of the three stories was highly interrelated: 824/1,894 participants (43.5%) were aware of all three news stories and a further 196/1,894 (10.3%) reported not being aware of any. Only 323/1,894 (17.1%) were aware of just one of the three stories and only 106/1,894 participants (5.6%) were aware of the news about breast screening, specifically. Participants were also more likely to be aware of the breast screening news story if they were white British, older, had higher levels of education or social class grade. Participants were less likely to be aware if they believed that screening was almost always a good idea. All other p-values were $\geq .207$ (Table 1).

Awareness of statistics from the breast screening media coverage and variables associated with awareness

Only 233 (18.4%) of the 1,264 participants who reported being aware of the story correctly recognised the number of women who had not been invited and only 268 (21.2%) correctly recognised the estimated number of women who had their lives shortened. 809 (64.0%) did not correctly identify either statistic and only 3.6% correctly identified both (Table 2). The model testing for demographic

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3 and psychological variables associated with correctly identifying either set of statistics found only
4 weak evidence against the null hypothesis for all characteristics (p-values were $\geq .087$ and $\geq .062$ in the
5 respective models; data not shown).
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10 **Awareness of media coverage and participants' trust their GPs and the NHS**

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12 In both these models, there was only weak evidence against the null hypothesis. Table 3 shows the
13 main results of binary logistic regression models consisting of 1,746 participants (p=.729 and .290).
14 Full results of the model are presented in Appendix 2 (Table D and Table E).
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19 **Awareness of media coverage and frequency of worry about breast cancer**

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21 Table 4 shows that there was only weak evidence against the null hypothesis (n=700; p=.084). Full
22 results are included in Appendix 2 (Table F).
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26 **Awareness of media coverage and future breast screening intentions**

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28 Table 5 shows that there was only weak evidence against the null hypothesis for this analysis (n=700;
29 p=.108). Full results are included in Appendix 2 (Table G).
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Table 1 – Full results of the binary logistic regression model testing for variables associated with awareness of the breast screening news story

		Aware vs. Not aware of the breast screening story (or not sure): n (%)		Adjusted OR, 95% CI	p-value
Characteristic	Total (n=1,792)	Not aware/sure (n=587; 32.8%)	Aware (n=1,205; 67.2%)	Aware of the screening story (vs. Not aware or not sure)	
Recruitment wave					
Wave 2: 20-26 th June	570	185 (32.5)	385 (67.5)	1.02, 0.79 to 1.31	.907
vs. Wave 1: 6-10 th June	1,222	402 (32.9)	820 (67.1)		
Age					Overall: <.0005
65+	549	111 (20.2)	438 (79.8)	7.77, 4.52 to 13.38	<.0005
55-64	252	53 (21.0)	199 (79.0)	6.75, 3.92 to 11.63	<.0005
45-54	241	47 (19.5)	194 (80.5)	7.70, 4.56 to 13.00	<.0005
35-44	248	88 (35.5)	160 (64.5)	3.60, 2.22 to 5.84	<.0005
25-34	275	142 (51.6)	133 (48.4)	2.00, 1.27 to 3.14	.003
vs. 16-24	227	146 (64.3)	81 (35.7)		
Gender					
Male	771	234 (30.4)	537 (69.6)	1.00, 0.74 to 1.35	.999
vs. Female	1,021	353 (34.6)	668 (65.4)		
Ethnicity					
White British	1,491	415 (27.8)	1,076 (72.2)	3.00, 2.20 to 4.09	<.0005
vs. Other groups	301	172 (57.1)	129 (42.9)		
Marital status					Overall: .914
Married/Living as a couple	985	279 (28.3)	706 (71.7)	1.07, 0.78 to 1.47	.672
Widowed/Divorced/Separated	354	84 (23.7)	270 (76.3)	1.06, 0.70 to 1.60	.792
vs. Single	453	224 (49.4)	229 (50.6)		
Highest level of education					Overall: .001
Graduate level/Above	501	131 (26.1)	370 (73.9)	2.08, 1.34 to 3.23	.001
A-levels/AS levels/Equivalent	448	162 (36.2)	286 (63.8)	1.80, 1.19 to 2.73	.006
GCSEs/Equivalent	440	156 (35.5)	284 (64.5)	1.36, 0.92 to 2.00	.120
Trade apprenticeships/Other	89	39 (43.8)	50 (56.2)	0.75, 0.42 to 1.32	.316
vs. No formal qualifications	314	99 (31.5)	215 (68.5)		
Social class grade					Overall: <.0005
Grade A or B	326	53 (16.3)	273 (83.7)	2.44, 1.59 to 3.73	<.0005
Grade C1	511	165 (32.3)	346 (67.7)	1.41, 1.02 to 1.95	.037
Grade C2	394	142 (36.0)	252 (64.0)	1.13, 0.81 to 1.58	.469
vs. Grade D or E	561	227 (40.5)	334 (59.5)		
Employment status					
Working	823	287 (34.9)	536 (65.1)	0.91, 0.68 to 1.22	.909
vs. Not working	969	300 (31.0)	669 (69.0)		
Area type					
Urban	1,458	476 (32.6)	982 (67.4)	1.21, 0.90 to 1.64	.207
vs. Rural	334	111 (33.2)	223 (66.8)		
Personal diagnosis of cancer					
Yes	150	34 (22.7)	116 (77.3)	1.18, 0.74 to 1.86	.490
vs. No	1,642	553 (33.7)	1,089 (66.3)		
Personal experience of breast screening					Overall: .552
Taken part	425	90 (21.2)	335 (78.8)	0.92, 0.60 to 1.41	.705
Invited, never taken part	55	13 (23.6)	42 (76.4)	0.66, 0.32 to 1.39	.276
vs. Not eligible or not invited	1,312	484 (36.9)	828 (63.1)		
Belief that screening is almost always a good idea					
Yes	1,649	547 (33.2)	1,102 (66.8)	0.59, 0.38 to 0.94	.025
vs. No or not sure	143	40 (28.0)	103 (72.0)		
Awareness of volcano news					
Yes	1,367	325 (23.8)	1,042 (76.2)	3.14, 2.39 to 4.12	<.0005
vs. No or not sure	425	262 (61.6)	163 (38.4)		
Awareness of election news					
Yes	1,138	292 (25.7)	846 (74.3)	1.37, 1.06 to 1.75	.014
vs. No or not sure	654	295 (45.1)	359 (54.9)		
General level of trust in NHS					Overall: .485
A lot	969	308 (31.8)	661 (68.2)	0.59, 0.29 to 1.18	.132
Somewhat	599	193 (32.2)	406 (67.8)	0.63, 0.31 to 1.27	.196
A little	169	69 (40.8)	100 (59.2)	0.58, 0.27 to 1.25	.166

vs. Not at all 55 17 (30.9) 38 (69.1)

Table 2 – Descriptive statistics of participants’ responses about key statistics in the breast screening media coverage; correct responses were “450,000” and “135-270”

n (% of total; 95% CI) (n=1,264)

Number of women who did not receive their final invitation...	Number of women who may have had their life shortened. Between...					Total
	135 - 270	13 - 27	13 - 2,700	1,350 - 2,700	Not sure	
450,000	46 (3.6)	6 (0.5)	79 (6.3)	71 (5.6)	31 (2.5)	233 (18.4)
4,500	68 (5.4)	20 (1.6)	28 (2.2)	22 (1.7)	30 (2.4)	168 (13.3)
45,000	130 (10.3)	22 (1.7)	76 (6.0)	86 (6.8)	54 (4.3)	368 (29.1)
4,500,000	3 (0.2)	1 (0.1)	10 (0.8)	20 (1.6)	4 (0.3)	38 (3.0)
Not sure	21 (2.1)	5 (0.4)	15 (1.2)	12 (0.9)	404 (32.0)	457 (36.2)
Total	268 (21.2)	54 (4.3)	208 (16.5)	211 (16.7)	523 (41.4)	

Table 3 – Testing for an association between awareness of the breast screening media coverage and trust in i) participants’ GPs and ii) the NHS*

Trust in participants’ GPs	A lot vs. Not at all; a little; somewhat: n (%)		Adjusted OR, 95% CI	p-value
Characteristic	Total (n=1,746)	Less than a lot (n=781; 44.7%)	A lot (n=965; 55.3%)	A lot (vs. Less than a lot)
Screening story awareness				Overall: .729
Aware of the main story and both follow-up commentaries	238	98 (41.2)	140 (58.8)	1.10, 0.74 to 1.64 .653
Aware of the main story and overdiagnosis follow-up	172	66 (38.4)	106 (61.6)	1.31, 0.85 to 2.03 .218
Aware of the main story and all-cause mortality follow-up	107	49 (45.8)	58 (54.2)	1.21, 0.73 to 2.02 .459
Aware of the main story only	655	280 (42.7)	375 (57.3)	1.17, 0.88 to 1.57 .283
vs. Unaware of the story	574	288 (50.2)	286 (49.8)	
Trust in the NHS				Overall: .290
Characteristic	Total (n=1,746)	Less than a lot (n=803; 46.0%)	A lot (n=943; 54.0%)	A lot (vs. Less than a lot)
Screening story awareness				Overall: .290
Aware of the main story and both follow-up commentaries	238	102 (42.9)	136 (57.1)	0.87, 0.59 to 1.30 .503
Aware of the main story and overdiagnosis follow-up	172	76 (44.2)	96 (55.8)	0.78, 0.51 to 1.21 .267
Aware of the main story and all-cause mortality follow-up	107	57 (53.3)	50 (46.7)	0.58, 0.35 to 0.97 .039
Aware of the main story only	655	299 (45.6)	356 (54.4)	0.81, 0.60 to 1.09 .160
vs. Unaware of the story	574	269 (46.9)	305 (53.1)	

*Results are adjusted for covariates; full results of the model are reported in the Appendix

Table 4 – Testing for an association between awareness of the breast screening media coverage and frequency of breast cancer worry*

Characteristic	Total (n=700)	Frequency of worry about breast cancer: n (%)					Adjusted OR, 95% CI	p-value
		Never (n=210; 30.0%)	Occasionally (n=231; 33.0%)	Sometimes (n=177; 25.3%)	Often (n=43; 6.1%)	Very often (n=39; 5.6%)		
Screening story awareness								Overall: .084
Aware of the main story and both follow-up commentaries	88	32 (36.4)	33 (37.5)	15 (17.0)	2 (2.3)	6 (6.8)	0.94, 0.56 to 1.56	.797
Aware of the main story and overdiagnosis follow-up	63	22 (34.9)	20 (31.7)	16 (25.4)	2 (3.2)	3 (4.8)	0.97, 0.56 to 1.68	.917
Aware of the main story and all-cause mortality follow-up	36	10 (27.8)	15 (41.7)	6 (16.7)	2 (5.6)	3 (8.3)	1.40, 0.71 to 2.78	.329
Aware of the main story only	270	64 (23.7)	89 (33.0)	74 (27.4)	23 (8.5)	20 (7.4)	1.51, 1.05 to 2.16	.025
vs. Unaware of the story	243	82 (33.7)	74 (30.5)	66 (27.2)	14 (5.8)	7 (2.9)		

*Results are adjusted for covariates; full results of the model are reported in the Appendix

Table 5 – Testing for an association between awareness of the breast screening media coverage and breast screening intentions*

Characteristic	Total (n=700)	Yes, definitely vs. Yes, probably; no, probably not; no, definitely not: n (%)		Adjusted OR, 95% CI	p-value
		No definite intention (n=99; 14.1%)	Definite intention (n=601; 85.9%)		
Screening story awareness					Overall: .108
Aware of the main story and both follow-up commentaries	88	10 (11.4)	78 (88.6)	2.01, 0.74 to 5.48	.172
Aware of the main story and overdiagnosis follow-up	63	4 (4.3)	59 (93.7)	2.66, 0.79 to 8.89	.113
Aware of the main story and all-cause mortality follow-up	36	6 (16.7)	30 (83.3)	0.66, 0.20 to 2.13	.486
Aware of the main story only	270	22 (8.1)	248 (91.9)	1.88, 0.99 to 3.57	.054
vs. Unaware of the story	243	57 (23.5)	186 (76.5)		

*Results are adjusted for covariates; full results of the model are reported in the Appendix

DISCUSSION

Previous studies have found evidence that media messages can increase usage of a range of healthcare services (e.g. ^{5-8, 10-13}). Awareness of this story about errors in the breast screening programme was hypothesised to be associated with lower trust in the NHS. However, the results of this study did not provide strong evidence against the null hypothesis for this or any associations tested. This may be a reflection of the news not undermining confidence in the Breast Screening Programme, or causing concern about breast cancer among women. If so, this might be partly attributable to the news story saying little to reduce the perceived benefits of breast screening itself, in contrast to media coverage of e.g. the independent review of breast cancer screening, which reported on the issue of overdiagnosis extensively.²²⁻²³ Relatedly, the present study found that awareness was notably lower for follow-up commentaries on the shortcomings of breast screening, compared with the main story. In addition, the framing of the story may have been expected to reinforce the perceived benefits of screening by indicating that missing screening had negative consequences in terms of additional breast cancer deaths.

Population awareness of the breast screening news story was generally high; television and radio were the main sources of information. This is broadly consistent with patterns of how most news is accessed, although the internet was used less often than observed in previous surveys.²⁴ Awareness of this story was related to awareness of other news stories, suggesting that an appreciable proportion of the population can be broadly dichotomised into those who are generally “news aware” and “news unaware”. These results do not suggest that a notable proportion of the public are aware of health news, specifically. In contrast to these findings, recall of the main statistics was markedly low and correct responses may be largely attributable

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9 to random guessing.¹ In some respects, this is surprising since the statistics were an integral
10 part of the story and often part of headlines (e.g. ^{2-4, 25}). This may suggest that people either
11 tend not to attend to or memorise this statistical information (meaning that they would not be
12 able to factor it into their appraisal of the significance of the story) or they retain only the 'gist' of
13 the statistics involved.²⁶ Awareness of the breast screening story was greater among those with
14 higher levels of education and social class grade, those who were white British, and those who
15 were older. Awareness of the breast screening news story was also lower among participants
16 with positive attitudes towards screening (who may have been less likely to attend to a negative
17 story).

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27 This study has limitations. Despite the large sample size and adjustment for a range of
28 potentially confounding variables, some odds ratios could not be estimated with a high degree
29 of precision. Confidence intervals were wide for key variables, meaning that associations may
30 not have been detected if they were real but smaller than observed. In addition, findings on
31 screening uptake only relate to anticipated future behaviour; future research could build on this
32 study by assessing whether the announcement was followed by a decrease (or increase) in
33 actual screening uptake. Members of the public were also less likely to participate in the survey
34 module based on a range of characteristics for which data were available. Results may be
35 biased, insofar as responses differed based on these variables.

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50 ¹ Participants were asked additional questions on the extent to which they trusted the statistics
51 and their reasons for not trusting them (if applicable). However, since responses were highly
52 suggestive of random guessing, no further analyses of these measures were attempted.
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Conclusions

This study found that news of errors in the Breast Screening Programme in England had reached a large proportion of the general public and that those aware of the media coverage tended to be those aware of news stories in general. The proportion of people aware was also higher among those who had more education, were in a higher social class grade, or were older. In contrast, awareness of key statistics from the story was very low among participants aware of the story, even less than six weeks after the onset of the main media coverage. The results of this study did not provide evidence that media coverage had any effects on trust in aspects of the health service among the general public, or worry about breast cancer or breast screening intentions among women. Future research should investigate possible effects of media coverage using objective measures of screening behaviour.

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APPENDIX 1 - SURVEY

[All Adults 16+ in England. Participants were shown the tablet screen and the following text was read out by interviewers]

Q.A In this part of the survey, I am going to ask you some questions related to health, including cancer, and recent news stories. These questions are asked on behalf of researchers from University College London. If you do not wish to answer a particular question during any part of this survey, you may refuse to answer and we will move to the next question. All your answers will be kept strictly confidential and you will be anonymous to the researchers.

The NHS currently offers breast cancer screening with mammography once every three years, to women aged between about 50 to 70 years in England.

Are you okay to continue with these questions?

1: Yes

2: No

As the questions can be perceived as sensitive, you can answer the questions on this machine yourself. I would now like to show you how to use the machine by going through a practice question with you.

[All Adults 16+ in England willing to continue. "Don't know"/"Not sure"/"Prefer not to say" appeared at the top of the screen, out of view of participants, except for questions that participants completed themselves. Interviewers showed the screen to participants]

This is an example of a single-coded question

Q.B What is your favourite colour?

1: Red

2: Yellow

1
2
3 3: Blue
4

5
6 4: Green
7

8 Other colour (PEN -WRITE IN)
9

10
11 Don't know
12

13
14 Refused
15

16
17
18
19 [All females aged 16-69 in England willing to continue. Interviewers handed tablets to participants and
20 stepped away from viewing the screen]
21

22
23
24 Q.1 Do you think you will go for breast screening when you are next offered it? REMEMBER TO TAP
25

26 OK TO CONTINUE
27

28
29 1: Yes, definitely
30

31 2: Yes, probably
32

33 3: No, probably not
34

35 4: No, definitely not
36

37
38 Not sure
39

40
41 Prefer not to say
42
43
44
45
46
47

48 [All females aged 47+ in England willing to continue]
49

50
51 Q.2 Have you ever been invited for breast screening before? If you've only ever been offered a
52 mammogram to investigate symptoms separately to the screening programme, please respond 'no'.
53

54
55 1: Yes
56

57
58 2: No
59
60

1
2
3 Not sure
4

5
6 Prefer not to say
7
8
9

10
11 [All females aged 47+ in England who have been invited for breast screening before]
12

13
14 Q.3 Have you ever been for breast screening as part of the screening programme?
15

16
17 1: Yes
18

19
20 2: No
21

22
23 Not sure
24

25
26 Prefer not to say
27
28
29

30
31 [All Adults 16+ in England willing to continue. This question allowed more than one response option.
32

33 "None of the above"/"Prefer not to say" were mutually exclusive with other responses]
34

35
36 Q.4 Which of the following, if any, have you been diagnosed with? Please choose all that apply.
37

38
39 1: Bowel cancer
40

41
42 2: Lung cancer
43

44
45 3: Breast cancer
46

47
48 4: Cervical cancer
49

50
51 5: Prostate cancer
52

53 Other type of cancer - PEN WRITE IN
54

55
56 None of the above
57

58
59 Prefer not to say
60

1
2
3 [All Adults 16+ in England willing to continue. This question allowed more than one response option.

4
5 "None of the above"/"Prefer not to say" were mutually exclusive with other responses]

6
7
8 Q.5 Has anyone you know ever been diagnosed with breast cancer? Please choose all that apply.

9
10
11
12
13 1: A close family member

14
15
16 2: Any other family member

17
18
19 3: A friend

20
21
22 4: A colleague

23
24
25 5: Any other person

26
27 Not sure

28
29
30 Prefer not to say

31
32
33
34
35 [All females aged 16+ in England willing to continue]

36
37
38 Q.6 How often do you worry about your chances of getting breast cancer yourself?

39
40
41 1: Never

42
43
44 2: Occasionally

45
46
47 3: Sometimes

48
49
50 4: Often

51
52
53 5: Very often

54
55 Not sure

56
57
58 Prefer not to say

59
60 Thank you for answering these questions - this is the end of this section for you.

1
2
3
4
5
6 [All Adults 16+ in England willing to continue. Participants handed the tablet back to the interviewer,
7 who showed the screen and either read out or allowed participants to read subsequent questions]
8
9

10 Q.7 In May, it was reported that a computer algorithm failure had meant that a number of women did
11 not receive invitations to their final routine breast cancer screening. The Health Secretary, Jeremy
12 Hunt, said that women affected will be contacted by letter with an invitation for a catch-up screening
13 test but some of the women who were not invited for their final appointment may have had their lives
14 shortened.
15
16
17
18
19

20 Do you recall seeing or hearing anything about this news story before now?
21
22

23 1: Yes
24

25 2: No
26
27

28 Not sure
29
30
31
32
33
34

35 [All who recall seeing or hearing anything about this news story before now. This was a multiple
36 choice question. The order of response options was randomised with "other websites" always
37 following both "online news websites" and "social media websites"]
38
39
40

41 Q.8 Do you recall where you saw or heard this news story? Please choose all that apply.
42
43

44 1: Television
45

46 2: Print newspaper(s)
47
48

49 3: Radio
50
51

52 4: Online news websites
53
54

55 5: Social media websites
56
57

58 6: Other websites
59
60

1
2
3 7: Word of mouth
4

5
6 Other sources – PEN WRITE IN
7

8 Not sure
9
10
11
12
13

14 [All who recall seeing or hearing anything about this news story before now]
15

16
17 Q.9 Did you discuss or share the story with anyone else?
18

19 1: Yes
20

21
22 2: No
23

24
25 Not sure
26
27
28
29

30
31 [All who recall seeing or hearing anything about this news story before now. Participants were
32 randomised to one of two orders of response options (1:1)]
33

34
35 Q.10 The Health Secretary, Jeremy Hunt, gave an estimate of the number of women who had failed
36 to get invitations since 2009.
37

38
39 Which of the following do you think is the estimate that he gave?
40

41
42 1: 4,500 women
43

44
45 2: 45,000 women
46

47
48 3: 450,000 women
49

50
51 4: 4,500,000 women
52

53 Not sure
54
55
56
57
58
59
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2
3 [All who recall seeing or hearing anything about this news story before now. Participants randomised
4 to one of two orders of response options (1:1)]
5
6

7
8 Q.11 The Health Secretary also gave an estimate, based on computer modelling, of the number of
9 women who may have had their lives shortened.
10

11
12 Which of the following do you think is the estimate that he gave?
13

14
15 1: Between 13 and 27 women
16

17
18 2: Between 135 and 270 women
19

20
21 3: Between 13 and 2,700 women
22

23
24 4: Between 1,350 and 2,700 women
25

26
27 Not sure
28
29
30

31
32 [All who gave an estimate in Q1 or Q11]
33

34
35 Q.12 How much did you trust these statistics when you heard them in the news?
36

37
38 1: Not at all
39

40
41 2: A little
42

43
44 3: Somewhat
45

46
47 4: A lot
48

49
50 Not sure
51
52

53
54 [All who do not trust the statistic]
55

56
57 Q.13 What were your reasons for not trusting these statistics when you heard them in the news?
58

59
60 PROBE: Any other reasons?

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3 OPEN ENDED
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7

8 [All who recall seeing or hearing anything about this news story before now]
9

10
11 Q.14 It was also reported that some health experts have said breast cancer screening can do “more
12 harm than good” because they believe “breast screening...has no impact on all-cause death”.
13
14

15
16 Do you recall seeing or hearing anything about this aspect of the news story before now?
17

18
19 1: Yes
20

21
22 2: No
23

24
25 Not sure
26
27
28
29

30 [All who recall seeing or hearing anything about this news story before now]
31

32 Q.15 The estimate of the number of women who may have had their lives shortened that the Health
33 Secretary gave was between 135 and 270. It was also reported that one statistics expert has said this
34 claim is “misleading” because they believe “there is only weak evidence that screening helps prolong
35 life, particularly for older women” and that “contrary to popular belief, screening also does harm...for
36 every 200 women attending screening between 50 and 70, we would expect one to have her early
37 death from breast cancer prevented, but three to be unnecessarily treated for a harmless cancer that
38 would not have troubled them”.
39
40
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50 Do you recall seeing or hearing anything about this aspect of the news story before now?
51

52
53 1: Yes
54

55
56 2: No
57

58
59 Not sure
60

1
2
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5
6 [All Adults 16+ in England willing to continue]
7

8 Q.16 In general, how much do you trust your general practitioner?
9

10
11 1: Not at all
12

13
14 2: A little
15

16
17 3: Somewhat
18

19
20 4: A lot
21

22
23 Not sure
24
25
26
27

28 [All Adults 16+ in England willing to continue]
29

30 Q.17 In general, how much do you trust the NHS?
31

32
33 1: Not at all
34

35
36 2: A little
37

38
39 3: Somewhat
40

41
42 4: A lot
43

44
45 Not sure
46
47
48
49

50 [All Adults 16+ in England willing to continue]
51

52 Q.18 Routine screening means testing healthy people to find cancer before they have any symptoms.
53

54 Do you think routine cancer screening tests for healthy people are almost always a good idea?
55

56
57 1: Yes
58

59
60 2: No

1
2
3 Not sure
4
5
6
7

8 [Participants were handed an information card with the following text and asked to read it]
9

10
11 You may have some questions about breast cancer screening after this part of the survey. You can
12 find out more by calling the NHS on a Freephone number (0800 169 2692) or via the web on
13 <https://www.nhs.uk/conditions/breast-cancer-screening/missed-invitations/>.
14
15
16
17

18
19
20 [All Adults 16+ in England willing to continue]
21

22
23 Q.19 It was also reported in May that a volcano had erupted in Hawaii, leading to officials declaring a
24 state of emergency and mandatory evacuation of 1,700 residents in the area.
25

26
27 Do you recall seeing or hearing anything about this news story before now?
28

29
30
31 1: Yes
32

33
34 2: No
35

36
37 Not sure
38
39
40
41

42 [All Adults 16+ in England willing to continue]
43

44
45 Q.20 The results of local elections held in England were also reported in May. The Labour Party won
46 2,350 seats, the Conservative Party won 1,332 seats, and the Liberal Democrats won 536 seats.
47

48
49 Do you recall seeing or hearing anything about this news story before now?
50

51
52 1: Yes
53

54
55 2: No
56

57
58 Not sure
59
60

1
2
3 [All Adults 16+ in England willing to continue]
4
5

6 Q.21 Please can I ask you what is the highest level of qualification you have received?
7

8 1: A. Graduate level qualifications and above: including higher degrees, professional qualifications at
9 HE standard (e.g. chartered accountant, surveyor, Nursing, Teaching), NVQ and SVQ Level 4 or 5,
10 Higher Education Diplomas, HNC and HND and BTEC Higher, RSA Higher Diploma
11
12

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15 2: B. A-levels and AS levels and equivalents: including SCE Higher, Scottish Certificate 6th Year
16 Studies, NVQ and SVQ and GSVQ level 3, GNVQ Advanced, ONC and OND and BTEC National,
17 City and Guilds Advanced Craft, City and Guilds Final level or Part III, RSA Advanced Diploma
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22 3: C. Trade apprenticeships
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25 4: D. GCSEs and equivalents: including O level, SCE Standard, CSEs, NVQ and SVQ and GSVQ
26 level 1 and 2, GNVQ and BTEC and SCOTVEC first, General diploma, City and Guilds Ordinary level,
27 City and Guilds Ordinary level Part II, RSA State I-III or Diploma, SCOTVEC modules
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31 5: E. Other qualifications (including overseas)
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34 6: F. No formal qualifications
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36 Don't know
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APPENDIX 2 – SUPPLEMENTARY TABLES

Table A – Summary statistics describing the sample

Measure	Total* (n=1,894)	%	(95% CI)
Awareness of the news about breast screening			
Aware of the main story and both follow-up commentaries	250	13.2	11.7 to 14.8
Aware of the main story and overdiagnosis follow-up	188	9.9	8.6 to 11.3
Aware of the main story and all-cause mortality follow-up	117	6.2	5.2 to 7.3
Aware of the main story only	709	37.4	35.3 to 39.6
Unaware of the story	630	33.3	31.2 to 35.4
Recruitment wave			
Wave 2: 20-26 th June	606	32.0	29.9 to 34.1
Wave 1: 6-10 th June	1,288	68.0	65.9 to 70.1
Gender			
Male	801	42.3	40.1 to 44.5
Female	1,093	57.7	55.5 to 59.9
Ethnicity			
White British	1,555	82.4	80.7 to 84.1
Other groups	331	17.6	15.9 to 19.3
Marital status			
Married or living as a married	1,039	54.9	52.6 to 57.1
Widowed, divorced and separated	382	20.2	18.4 to 22.0
Single	473	25.0	23.1 to 27.0
Highest level of education			
Graduate level qualifications and above	530	28.2	26.2 to 30.3
A-levels and AS levels and equivalents	461	24.6	22.7 to 26.5
GCSEs and equivalents	459	24.5	22.5 to 26.4
Trade apprenticeships or other qualifications	93	5.0	4.0 to 6.0
No formal qualifications	334	17.8	16.1 to 19.6
Social class grade			
Grade A or B	336	17.7	16.1 to 19.5
Grade C1	539	28.5	26.5 to 30.5
Grade C2	423	22.3	20.5 to 24.3
Grade D or E	596	31.5	29.4 to 33.6
Employment status			
Working	862	45.5	43.3 to 47.8
Not working	1,032	54.5	52.2 to 56.7
Area type			
Urban	1,542	81.4	79.6 to 83.1
Rural	352	18.6	16.9 to 20.4
Personal diagnosis of cancer			
Yes	156	8.4	7.2 to 9.7
No	1,705	91.6	90.3 to 92.8
Personal experience of breast screening			
Taken part	441	23.7	21.8 to 25.7
Invited, never taken part	56	3.0	2.3 to 3.9
Not eligible or not invited	1,364	73.3	71.2 to 75.3
Belief that screening is almost always a good idea			
Yes	1,737	91.7	90.4 to 92.9
No or not sure	157	8.3	7.1 to 9.6
Awareness of the news about the volcanic eruption			
Yes	1,435	75.8	73.8 to 77.7
No or not sure	459	24.2	22.3 to 26.2
Awareness of the news about the local elections			
Yes	1,198	63.3	61.1 to 65.4
No or not sure	696	36.7	34.6 to 38.9
General level of trust in GP			
A lot	1,009	55.2	52.9 to 57.5
Somewhat	540	29.6	27.5 to 31.7
A little	219	12.0	10.6 to 13.5
Not at all	59	3.2	2.5 to 4.1
General level of trust in NHS			
A lot	1,016	54.2	54.9 to 59.5
Somewhat	619	33.0	32.7 to 37.1

1	A little	184	9.8	9.0 to 11.8
2	Not at all	56	3.0	2.4 to 4.0
3	Frequency of worry about breast cancer			
4	Very often	46	4.6	3.4 to 6.0
5	Often	55	5.4	4.2 to 7.0
6	Sometimes	216	21.4	18.9 to 24.0
7	Occasionally	302	29.9	27.1 to 32.8
8	Never	391	38.7	35.7 to 41.7
9	Breast screening intentions for next invitation			
10	Yes, definitely	690	84.7	82.1 to 87.0
11	Yes, probably	88	10.8	8.8 to 13.1
12	No, probably not	18	2.2	1.4 to 3.4
13	No, definitely not	19	2.3	1.5 to 3.5

Table B – Full results of the binary logistic regression model testing for variables associated with whether participants responded to questions on the survey module

		Responded vs. Did not respond to the survey questions: n (%)		Adjusted OR, 95% CI	p-value
Characteristic	Total (n=2,665)	Did not respond (n=779; 29.2%)	Responded (n=1,886; 70.8%)	Responded to questions (vs. Did not respond)	
Recruitment wave					
Wave 2: 20-26 th June	908	303 (33.4)	605 (66.6)	0.73, 0.61 to 0.87	<.0005
vs. Wave 1: 6-10 th June	1,757	476 (27.1)	1,281 (72.9)		
Gender					
Male	1,270	474 (37.3)	796 (62.7)	0.46, 0.39 to 0.55	<.0005
vs. Female	1,395	305 (21.9)	1,090 (78.1)		
Ethnicity					
White British	2,139	584 (27.3)	1,555 (72.7)	1.69, 1.37 to 2.10	<.0005
vs. Other groups	526	195 (37.1)	331 (62.9)		
Marital status					
Married/Living as a couple	1,441	407 (28.2)	1,034 (71.8)	1.48, 1.18 to 1.85	Overall: .001 .001
Widowed/Divorced/Separated	517	135 (26.1)	382 (73.9)		
vs. Single	707	237 (33.5)	470 (66.5)		
Social class grade					
Grade A or B	450	115 (25.6)	335 (74.4)	1.54, 1.18 to 2.02	Overall: .003 .002 .002 .045
Grade C1	726	190 (26.2)	536 (73.8)		
Grade C2	596	174 (29.2)	422 (70.8)		
vs. Grade D or E	893	300 (33.6)	593 (66.4)		
Employment status					
Working	1,225	366 (29.9)	859 (70.1)	0.79, 0.65 to 0.97	.026
vs. Not working	1,440	413 (28.7)	1,027 (71.3)		
Area type					
Urban	2,164	629 (29.1)	1,535 (70.9)	1.14, 0.91 to 1.42	.246
vs. Rural	501	150 (29.9)	351 (70.1)		
Age (in years)					
	2,665	52.1 (21.0)	50.8 (20.5)	0.99, 0.98 to 1.00	<.0005

Table C – Sources of news about the breast screening story

Source of information	Total (n=1,264)	%	(95% CI)
Television	971	76.8	74.4 to 79.1
Radio	271	21.4	19.2 to 23.8
Print newspaper(s)	169	13.4	11.6 to 15.3
Online news websites	134	10.6	9.0 to 12.4
Social media websites	68	5.4	4.2 to 6.7
Other websites	11	0.9	0.5 to 1.5
Word of mouth	43	3.4	2.5 to 4.5
Other sources	8	0.6	0.3 to 1.2
Discussed or shared the story with someone else	450	35.6	33.0 to 38.3

Table D – Full results of the binary logistic regression model testing for an association between awareness of the breast screening media coverage and trust in participants' GPs

		A lot vs. Not at all; a little; somewhat: n (%)		Adjusted OR, 95% CI	p-value
Characteristic	Total (n=1,746)	Less than a lot (n=781; 44.7%)	A lot (n=965; 55.3%)	A lot (vs. Less than a lot)	
Screening story awareness					Overall: .729
Aware of the main story and both follow-up commentaries	238	98 (41.2)	140 (58.8)	1.10, 0.74 to 1.64	.653
Aware of the main story and overdiagnosis follow-up	172	66 (38.4)	106 (61.6)	1.31, 0.85 to 2.03	.218
Aware of the main story and all-cause mortality follow-up	107	49 (45.8)	58 (54.2)	1.21, 0.73 to 2.02	.459
Aware of the main story only	655	280 (42.7)	375 (57.3)	1.17, 0.88 to 1.57	.283
vs. Unaware of the story	574	288 (50.2)	286 (49.8)		
Recruitment wave					
Wave 2: 20-26 th June	557	255 (45.8)	663 (55.8)	0.81, 0.64 to 1.04	.097
vs. Wave 1: 6-10 th June	1,189	526 (44.2)	302 (54.2)		
Gender					
Male	754	317 (42.0)	437 (58.0)	1.15, 0.86 to 1.54	.334
vs. Female	992	464 (46.8)	528 (53.2)		
Ethnicity					
White British	1,450	614 (42.3)	836 (57.7)	1.17, 0.85 to 1.61	.328
vs. Other groups	296	167 (54.4)	129 (43.6)		
Marital status					Overall: .504
Married/Living as a couple	964	422 (42.8)	542 (56.2)	1.04, 0.77 to 1.42	.782
Widowed/Divorced/Separated	341	139 (40.8)	202 (59.2)	0.86, 0.57 to 1.29	.460
vs. Single	441	220 (49.9)	221 (50.1)		
Highest level of education					Overall: .056
Graduate level/Above	494	230 (46.6)	264 (53.4)	0.64, 0.42 to 0.98	.042
A-levels/AS levels/Equivalent	438	201 (45.9)	237 (54.1)	0.70, 0.46 to 1.06	.089
GCSEs/Equivalent	429	213 (49.7)	216 (50.3)	0.63, 0.43 to 0.94	.022
Trade apprenticeships/Other	86	41 (47.7)	45 (52.3)	0.44, 0.25 to 0.80	.007
vs. No formal qualifications	299	96 (32.1)	203 (67.9)		
Social class grade					Overall: .711
Grade A or B	317	128 (40.4)	189 (59.6)	1.20, 0.82 to 1.76	.342
Grade C1	505	231 (45.7)	274 (54.3)	1.02, 0.74 to 1.39	.923
Grade C2	385	181 (47.0)	204 (53.0)	0.97, 0.70 to 1.36	.874
vs. Grade D or E	539	241 (44.7)	298 (55.3)		
Employment status					
Working	806	411 (51.0)	395 (49.0)	0.82, 0.63 to 1.07	.135
vs. Not working	940	370 (39.4)	570 (60.6)		
Area type					
Urban	1,420	635 (44.7)	785 (55.3)	1.12, 0.84 to 1.50	.430
vs. Rural	326	146 (44.8)	180 (55.2)		
Personal diagnosis of cancer					
Yes	1,599	718 (44.9)	881 (55.1)	0.84, 0.55 to 1.28	.404
vs. No	147	63 (42.9)	84 (57.1)		
Personal experience of breast screening					Overall: .284
Taken part	411	159 (38.7)	252 (61.3)	1.33, 0.91 to 1.95	.145
Invited, never taken part	48	21 (43.8)	27 (56.3)	0.95, 0.46 to 1.98	.894
vs. Not eligible or not invited	1,287	601 (46.7)	686 (53.3)		
Belief that screening is almost always a good idea					
Yes	1,609	701 (43.6)	908 (56.4)	1.30, 0.85 to 1.97	.230
vs. No or not sure	137	80 (58.4)	57 (41.6)		
Awareness of volcano news					
Yes	1,332	565 (42.4)	767 (57.6)	1.04, 0.77 to 1.40	.789
vs. No or not sure	414	216 (52.2)	198 (47.8)		
Awareness of election news					
Yes	1,114	467 (41.9)	647 (58.1)	1.19, 0.93 to 1.54	.172

vs. No or not sure	632	314 (49.7)	318 (50.3)		
1 General level of trust in NHS					Overall: <.0005
2 A lot	943	202 (21.4)	741 (78.6)	13.53, 6.65 to 27.54	<.0005
3 Somewhat	589	409 (69.4)	180 (30.6)	1.62, 0.80 to 3.31	.183
4 A little	163	130 (79.8)	33 (20.2)	1.00, 0.46 to 2.21	.994
5 vs. Not at all	51	40 (78.4)	11 (21.6)		
6 Age (in years)	1,746	46.9 (19.1)	53.9 (21.0)	1.01, 1.00 to 1.02	.087

Table E – Full results of the binary logistic regression model testing for an association between awareness of the breast screening media coverage and trust in the NHS

Characteristic	Total (n=1,746)	A lot vs. Not at all; a little; somewhat: n (%)		Adjusted OR, 95% CI	p-value
		Less than a lot (n=803; 46.0%)	A lot (n=943; 54.0%)		
Screening story awareness					Overall: .290
Aware of the main story and both follow-up commentaries	238	102 (42.9)	136 (57.1)	0.87, 0.59 to 1.30	.503
Aware of the main story and overdiagnosis follow-up	172	76 (44.2)	96 (55.8)	0.78, 0.51 to 1.21	.267
Aware of the main story and all-cause mortality follow-up	107	57 (53.3)	50 (46.7)	0.58, 0.35 to 0.97	.039
Aware of the main story only	655	299 (45.6)	356 (54.4)	0.81, 0.60 to 1.09	.160
vs. Unaware of the story	574	269 (46.9)	305 (53.1)		
Recruitment wave					
Wave 2: 20-26 th June	557	248 (44.5)	309 (55.5)	1.21, 0.95 to 1.55	.118
vs. Wave 1: 6-10 th June	1,189	555 (46.7)	634 (53.3)		
Age					Overall: .052
65+	530	198 (37.4)	332 (62.6)	1.04, 0.61 to 1.79	.880
55-64	245	111 (45.3)	134 (54.7)	0.76, 0.44 to 1.30	.309
45-54	235	115 (48.9)	120 (51.1)	0.83, 0.50 to 1.39	.484
35-44	245	135 (55.1)	110 (44.9)	0.59, 0.36 to 0.96	.035
25-34	265	152 (57.4)	113 (42.6)	0.56, 0.35 to 0.91	.018
vs. 16-24	226	92 (40.7)	134 (59.3)		
Gender					
Male	754	319 (42.3)	435 (57.7)	0.99, 0.73 to 1.33	.985
vs. Female	992	484 (48.8)	508 (51.2)		
Ethnicity					
White British	1,450	634 (43.7)	816 (56.3)	1.47, 1.07 to 2.02	.019
vs. Other groups	296	169 (57.1)	127 (42.9)		
Marital status					Overall: .870
Married/Living as a couple	964	440 (45.6)	524 (54.4)	1.07, 0.78 to 1.47	.685
Widowed/Divorced/Separated	341	151 (44.3)	190 (55.7)	1.00, 0.66 to 1.50	.990
vs. Single	441	212 (48.1)	229 (51.9)		
Highest level of education					Overall: .076
Graduate level/Above	494	233 (47.2)	261 (52.8)	1.20, 0.79 to 1.83	.386
A-levels/AS levels/Equivalentents	438	199 (45.4)	239 (54.6)	1.12, 0.75 to 1.67	.582
GCSEs/Equivalentents	429	224 (52.2)	205 (47.8)	0.86, 0.59 to 1.26	.447
Trade apprenticeships/Other	86	32 (37.2)	54 (62.8)	1.85, 1.01 to 3.39	.047
vs. No formal qualifications	299	115 (38.5)	184 (61.5)		
Social class grade					Overall: .990
Grade A or B	317	140 (44.2)	177 (55.8)	0.96, 0.65 to 1.41	.828
Grade C1	505	232 (45.9)	273 (54.1)	0.99, 0.72 to 1.37	.968
Grade C2	385	179 (46.5)	206 (53.5)	1.02, 0.73 to 1.43	.892
vs. Grade D or E	539	252 (46.8)	206 (53.5)		
Employment status					
Working	806	410 (50.9)	396 (49.1)	0.94, 0.71 to 1.25	.673
vs. Not working	940	393 (41.8)	547 (58.2)		
Area type					
Urban	1,420	656 (46.2)	764 (53.8)	0.96, 0.72 to 1.29	.795
vs. Rural	326	147 (45.1)	179 (54.9)		

Personal diagnosis of cancer						
1	Yes	1,599	737 (46.1)	862 (53.9)	1.00, 0.66 to 1.50	.994
2	vs. No	147	66 (44.9)	81 (55.1)		
Personal experience of breast screening					Overall: .062	
3	Personal experience of breast screening					
4	screening					
5	Taken part	411	193 (47.0)	218 (53.0)	0.65, 0.43 to 0.97	.035
6	Invited, never taken part	48	20 (41.7)	28 (58.3)	1.10, 0.51 to 2.35	.813
7	vs. Not eligible or not invited	1,287	590 (45.8)	697 (54.2)		
Belief that screening is almost always a good idea						
8	Belief that screening is almost					
9	always a good idea					
10	Yes	1,609	715 (44.4)	894 (55.6)	1.96, 1.28 to 3.00	.002
11	vs. No or not sure	137	88 (64.2)	49 (35.8)		
Awareness of volcano news						
12	Awareness of volcano news					
13	Yes	1,332	594 (44.6)	738 (55.4)	1.00, 0.74 to 1.35	.987
14	vs. No or not sure	414	209 (50.5)	205 (49.5)		
Awareness of election news						
15	Awareness of election news					
16	Yes	1,114	491 (44.1)	623 (55.9)	1.03, 0.80 1.33	.817
17	vs. No or not sure	632	312 (49.4)	320 (50.6)		
General level of trust in GP					Overall: <.0005	
18	General level of trust in GP					
19	A lot	965	224 (23.2)	741 (76.8)	11.98, 6.07 to 23.64	<.0005
20	Somewhat	513	370 (72.1)	143 (27.9)	1.39, 0.70 to 2.76	.350
21	A little	212	165 (77.8)	47 (22.2)	1.12, 0.54 to 2.33	.770
22	vs. Not at all	56	44 (78.6)	12 (21.4)		

Table F – Full results of the ordinal logistic regression model testing for an association between awareness of the breast screening media coverage and frequency of breast cancer worry

		Frequency of worry about breast cancer: n (%) / M (SD)					Adjusted OR, 95% CI	p-value
Characteristic	Total (n=700)	Never (n=210; 30.0%)	Occasionally (n=231; 33.0%)	Sometimes (n=177; 25.3%)	Often (n=43; 6.1%)	Very often (n=39; 5.6%)	More frequent worry about breast cancer	
Screening story awareness								Overall: .084
Aware of the main story and both follow-up commentaries	88	32 (36.4)	33 (37.5)	15 (17.0)	2 (2.3)	6 (6.8)	0.94, 0.56 to 1.56	.797
Aware of the main story and overdiagnosis follow-up	63	22 (34.9)	20 (31.7)	16 (25.4)	2 (3.2)	3 (4.8)	0.97, 0.56 to 1.68	.917
Aware of the main story and all-cause mortality follow-up	36	10 (27.8)	15 (41.7)	6 (16.7)	2 (5.6)	3 (8.3)	1.40, 0.71 to 2.78	.329
Aware of the main story only	270	64 (23.7)	89 (33.0)	74 (27.4)	23 (8.5)	20 (7.4)	1.51, 1.05 to 2.16	.025
vs. Unaware of the story	243	82 (33.7)	74 (30.5)	66 (27.2)	14 (5.8)	7 (2.9)		
Recruitment wave								
Wave 2: 20-26 th June	229	81 (35.4)	71 (31.0)	52 (22.7)	11 (4.8)	14 (6.1)	0.81, 0.60 to 1.10	.174
vs. Wave 1: 6-10 th June	471	129 (27.4)	160 (34.0)	125 (26.5)	32 (6.8)	25 (5.3)		
Ethnicity								
White British	563	160 (28.4)	194 (34.5)	140 (24.9)	35 (6.2)	34 (6.0)	1.06, 0.73 to 1.54	.766
vs. Other groups	137	50 (36.5)	37 (27.0)	37 (27.0)	8 (5.8)	5 (3.6)		
Marital status								Overall: .138
Married/Living as a couple	403	106 (26.3)	149 (37.0)	99 (24.6)	26 (6.5)	23 (5.7)	1.40, 0.99 to 1.98	.060
Widowed/Divorced/Separated	100	34 (34.0)	24 (24.0)	29 (29.0)	5 (5.0)	8 (8.0)	1.48, 0.90 to 2.44	.123
vs. Single	197	70 (35.5)	58 (29.4)	49 (24.9)	12 (6.1)	8 (4.1)		
Highest level of education								Overall: .017
Graduate level/Above	230	65 (28.3)	84 (36.5)	62 (27.0)	11 (4.8)	8 (3.5)	0.43, 0.24 to 0.76	.004
A-levels/AS levels/Equivalent	206	67 (32.5)	71 (34.5)	43 (20.9)	14 (6.8)	11 (5.3)	0.40, 0.23 to 0.70	.001
GCSEs/Equivalent	176	51 (29.0)	54 (30.7)	44 (25.0)	15 (8.5)	12 (6.8)	0.58, 0.34 to 0.99	.045
Trade apprenticeships/Other	17	6 (35.3)	6 (35.3)	5 (29.4)	0 (0.0)	0 (0.0)	0.42, 0.15 to 1.14	.087
vs. No formal qualifications	71	21 (29.6)	16 (22.5)	23 (32.4)	3 (4.2)	8 (11.3)		
Social class grade								Overall: .206
Grade A or B	125	28 (22.4)	56 (44.8)	30 (24.0)	3 (2.4)	8 (6.4)	1.44, 0.89 to 2.33	.141
Grade C1	209	52 (24.9)	71 (34.0)	59 (28.2)	18 (8.6)	9 (4.3)	1.46, 0.97 to 2.22	.073
Grade C2	165	57 (34.5)	48 (29.1)	38 (23.0)	14 (8.5)	8 (4.8)	1.08, 0.70 to 1.64	.740
vs. Grade D or E	201	73 (36.3)	56 (27.9)	50 (24.9)	8 (4.0)	14 (7.0)		
Employment status								
Working	392	106 (27.0)	133 (33.9)	110 (28.1)	27 (6.9)	16 (4.1)	1.03, 0.76 to 1.39	.856
vs. Not working	308	104 (33.8)	98 (31.8)	67 (21.8)	16 (5.2)	23 (7.5)		
Area type								
Urban	574	179 (31.2)	187 (32.6)	142 (24.7)	34 (5.9)	32 (5.6)	0.79, 0.55 to 1.13	.200

vs. Rural	126	31 (24.6)	16 (36.4)	8 (18.2)	3 (6.8)	7 (15.9)		
1 Personal diagnosis of cancer								
2 Yes	44	10 (22.7)	16 (36.4)	8 (18.2)	3 (6.8)	7 (15.9)	2.13, 1.18 to 3.83	.012
3 vs. No	656	200 (30.5)	215 (32.8)	169 (25.8)	40 (6.1)	32 (4.9)		
4 Personal experience of breast screening								Overall: .629
5								
6 Taken part	221	77 (34.8)	74 (33.5)	45 (20.4)	8 (3.6)	17 (7.7)	0.77, 0.46 to 1.31	.342
7 Invited, never taken part	34	12 (35.3)	11 (32.4)	7 (20.6)	2 (5.9)	2 (5.9)	0.87, 0.94 to 1.90	.722
8 vs. Not eligible or not invited	445	121 (27.2)	146 (32.8)	125 (28.1)	33 (7.4)	20 (4.5)		
9 Belief that screening is almost always a good idea								
10								
11 Yes	660	192 (29.1)	220 (33.3)	167 (25.3)	42 (6.4)	39 (5.9)	1.28, 0.65 to 2.49	.478
12 vs. No or not sure	40	18 (45.0)	11 (27.5)	10 (25.0)	1 (2.5)	0 (0.0)		
13 Awareness of volcano news								
14 Yes	505	148 (29.3)	175 (34.7)	122 (24.2)	30 (5.9)	30 (5.9)	0.94, 0.66 to 1.34	.739
15 vs. No or not sure	195	62 (31.8)	56 (28.7)	55 (28.2)	13 (6.7)	9 (4.6)		
16 Awareness of election news								
17 Yes	424	130 (30.7)	145 (34.2)	101 (23.8)	21 (5.0)	27 (6.4)	0.86, 0.63 to 1.16	.320
18 vs. No or not sure	276	80 (29.0)	86 (31.2)	76 (27.5)	22 (8.0)	12 (4.3)		
19 General level of trust in GP								Overall: .618
20 A lot	339	105 (31.0)	115 (33.9)	81 (23.9)	19 (5.6)	19 (5.6)	1.12, 0.52 to 2.42	.771
21 Somewhat	221	55 (24.9)	76 (34.4)	61 (27.6)	19 (5.6)	10 (4.5)	1.35, 0.62 to 2.94	.443
22 A little	109	37 (33.9)	32 (29.4)	31 (28.4)	3 (2.8)	6 (5.5)	1.04, 0.47 to 2.29	.923
23 vs. Not at all	31	13 (41.9)	8 (25.8)	4 (12.9)	2 (6.5)	4 (12.9)		
24 General level of trust in NHS								Overall: .209
25 A lot	344	106 (30.8)	117 (34.0)	78 (22.7)	24 (7.0)	19 (5.5)	2.16, 0.88 to 5.27	.092
26 Somewhat	257	65 (25.3)	86 (33.5)	75 (29.2)	18 (7.0)	13 (5.1)	2.55, 1.04 to 6.25	.040
27 A little	76	25 (32.9)	26 (34.2)	19 (25.0)	0 (0.0)	6 (7.9)	2.26, 0.88 to 5.79	.090
28 vs. Not at all	23	14 (60.9)	2 (8.7)	5 (21.7)	1 (4.3)	1 (4.3)		
29 Future breast screening intentions								Overall: .005
30 Yes, definitely	601	165 (27.5)	204 (33.9)	157 (26.1)	39 (6.5)	36 (6.0)	3.32, 1.19 to 9.27	.022
31 Yes, probably	70	25 (35.7)	24 (34.3)	15 (21.4)	3 (4.3)	3 (4.3)	2.18, 0.72 to 6.54	.166
32 No, probably not	13	10 (76.9)	2 (15.4)	0 (0.0)	1 (7.7)	0 (0.0)	0.56, 0.11 to 2.97	.499
33 vs. No, definitely not	16	10 (62.5)	1 (6.3)	5 (31.3)	0 (0.0)	0 (0.0)		
34 Age (in years)	700	44.8 (16.0)	42.6 (15.0)	40.9 (14.1)	39.1 (13.0)	48.6 (14.7)	0.99, 0.97 to 1.01	.159

Table G – Full results of the binary logistic regression model testing for an association between awareness of the breast screening media coverage and breast screening intentions

		Yes, definitely vs. Yes, probably; no, probably not; no, definitely not: n (%)		Adjusted OR, 95% CI	p-value
	Total (n=700)	No definite intention (n=99; 14.1%)	Definite intention (n=601; 85.9%)	Definite intention (vs. No definite intention)	
Screening story awareness					
					Overall: .108
Aware of the main story and both follow-up commentaries	88	10 (11.4)	78 (88.6)	2.01, 0.74 to 5.48	.172
Aware of the main story and overdiagnosis follow-up	63	4 (4.3)	59 (93.7)	2.66, 0.79 to 8.89	.113
Aware of the main story and all-cause mortality follow-up	36	6 (16.7)	30 (83.3)	0.66, 0.20 to 2.13	.486
Aware of the main story only	270	22 (8.1)	248 (91.9)	1.88, 0.99 to 3.57	.054
vs. Unaware of the story	243	57 (23.5)	186 (76.5)		
Recruitment wave					
Wave 2: 20-26 th June	229	40 (17.5)	189 (82.5)	0.71, 0.42 to 1.21	.211
vs. Wave 1: 6-10 th June	471	59 (12.5)	412 (87.5)		
Age					
					Overall: .050
65+	69	7 (10.1)	62 (89.9)	0.84, 0.13 to 5.37	.855
55-64	123	5 (4.1)	118 (95.9)	2.49, 0.42 to 14.74	.313
45-54	128	10 (7.8)	118 (92.2)	3.59, 1.10 to 11.69	.034
35-44	143	21 (14.7)	122 (85.3)	2.72, 1.16 to 6.41	.022
25-34	144	29 (20.1)	115 (79.9)	2.82, 1.24 to 6.42	.014
vs. 16-24	93	27 (29.0)	66 (71.0)		
Ethnicity					
White British	563	72 (12.8)	491 (87.2)	0.96, 0.51 to 1.83	.905
vs. Other groups	137	27 (19.7)	110 (80.3)		
Marital status					
					Overall: .321
Married/Living as a couple	403	49 (12.2)	354 (87.8)	0.99, 0.53 to 1.84	.970
Widowed/Divorced/Separated	100	6 (6.0)	94 (94.0)	2.18, 0.73 to 6.53	.163
vs. Single	197	44 (22.3)	153 (77.7)		
Highest level of education					
					Overall: .169
Graduate level/Above	230	35 (15.2)	195 (84.8)	0.69, 0.22 to 2.20	.533
A-levels/AS levels/Equivalentents	206	35 (17.0)	171 (83.0)	0.87, 0.29 to 2.62	.808
GCSEs/Equivalentents	176	19 (10.8)	157 (89.2)	1.92, 0.62 to 5.92	.259
Trade apprenticeships/Other	17	3 (17.6)	14 (82.4)	1.38, 0.24 to 0.81	.720
vs. No formal qualifications	71	7 (9.9)	64 (90.1)		
Social class grade					
					Overall: .186
Grade A or B	125	14 (11.2)	111 (88.8)	1.87, 0.76 to 4.61	.177
Grade C1	209	25 (12.0)	184 (88.0)	2.36, 1.08 to 5.16	.032
Grade C2	165	24 (14.5)	141 (85.5)	1.85, 0.86 to 3.98	.118
vs. Grade D or E	201	36 (17.9)	165 (82.1)		
Employment status					
Working	392	56 (14.3)	336 (85.7)	0.70, 0.39 to 1.26	.238
vs. Not working	308	43 (14.0)	265 (86.0)		
Area type					
Urban	574	83 (14.5)	491 (85.5)	0.79, 0.39 to 1.59	.512
vs. Rural	126	16 (12.7)	110 (87.3)		
Personal diagnosis of cancer					
Yes	44	7 (15.9)	37 (84.1)	0.94, 0.30 to 2.98	.918
vs. No	656	92 (14.0)	564 (86.0)		
Personal experience of breast screening					
					Overall: .013
Taken part	221	9 (4.1)	212 (95.9)	6.12, 1.37 to 27.33	.018
Invited, never taken part	34	6 (17.6)	28 (82.4)	0.99, 0.21 to 4.61	.986
vs. Not eligible or not invited	445	84 (18.9)	361 (81.1)		
Belief that screening is almost always a good idea					
Yes	660	81 (12.3)	579 (87.7)	9.08, 3.77 to 21.88	<.0005
vs. No or not sure	40	18 (45.0)	22 (55.0)		

Awareness of volcano news						
1	Yes	505	54 (10.7)	451 (89.3)	1.34, 0.74 to 2.41	.335
2	vs. No or not sure	195	45 (23.1)	150 (76.9)		
Awareness of election news						
4	Yes	424	47 (11.1)	377 (88.9)	1.42, 0.82 to 2.46	.208
5	vs. No or not sure	276	52 (18.8)	224 (81.2)		
General level of trust in GP						
						Overall: .025
7	A lot	339	31 (9.1)	308 (90.9)	1.55, 0.45 to 5.29	.487
8	Somewhat	221	44 (19.9)	177 (80.1)	0.76, 0.23 to 5.67	.663
9	A little	109	16 (14.7)	93 (85.3)	2.48, 0.69 to 8.90	.163
10	vs. Not at all	31	8 (25.8)	23 (74.2)		
General level of trust in NHS						
						Overall: .007
12	A lot	344	34 (9.9)	310 (90.1)	1.16, 0.29 to 4.64	.832
13	Somewhat	257	42 (16.3)	215 (83.7)	0.70, 0.18 to 2.79	.614
14	A little	76	18 (23.7)	58 (76.3)	0.27, 0.06 to 1.11	.068
15	vs. Not at all	23	5 (21.7)	18 (78.3)		
Frequency of breast cancer worry						
						Overall: .028
17	Very often	39	3 (7.7)	36 (92.3)	3.00, 0.72 to 12.51	.132
18	Often	43	5 (9.3)	39 (90.7)	2.95, 0.85 to 10.26	.089
19	Sometimes	177	20 (11.3)	157 (88.7)	2.59, 1.31 to 5.15	.006
20	Occasionally	231	27 (11.7)	204 (88.3)	2.15, 1.15 to 4.02	.016
21	vs. Never	210	45 (21.4)	165 (78.6)		

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Public awareness of and responses to media coverage of invitation errors in the Breast Screening Programme in England: A cross-sectional population survey

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Authors:

Alex Ghanouni^a a.ghanouni@ucl.ac.uk

Christian von Wagner^a c.wagner@ucl.ac.uk

Jo Waller^{ab} j.waller@ucl.ac.uk | Tel: +44 (0)20 7679 5958 | Fax: +44 (0)20 7679 8354

Affiliations:

^aResearch Department of Behavioural Science and Health, University College London, Gower Street, London, WC1E 6BT, United Kingdom

^bCorresponding author

ABSTRACT

Objectives: In May 2018, the British Health Secretary announced the 'serious failure' that 450,000 women had missed out on invitations to breast screening in England, leading to extensive media coverage. This study measured public awareness of the story and tested for associated factors (e.g. educational level and trust in the NHS).

Design: A computer-assisted face-to-face survey in June 2018.

Setting: Participants completed the survey in their homes.

Participants: Males and females aged 16 years or older in England.

Primary and secondary outcome measures: Awareness of aspects of the media coverage and reported statistics. Other data included demographics (e.g. ethnicity), awareness of unrelated contemporaneous news stories, trust in participants' GPs and the NHS, and (among women) worry about breast cancer and future breast screening intentions.

Results: Descriptive statistics showed that 66.7% of 1,894 participants reported being aware of the media coverage. Regression analyses showed that those who were aware of other news stories, were white British, and had a higher level of education or social class grade were more likely to be aware. In contrast, only 36.0% correctly identified at least one of two headline statistics. This study did not find evidence that awareness was negatively associated with trust in participants' GPs or the NHS, breast cancer worry or future breast cancer screening intentions.

Conclusions: Awareness of the breast screening news story was high but recall of reported statistics was much lower: the public may have retained only the gist of quantitative information. Associations between story awareness and attitudes or behaviour were not apparent.

Keywords: Breast imaging; Journalism; Organisation of health services; Public Health

Strengths and limitations of this study:

- This study builds on previous research on media coverage around public health concerns by measuring levels of awareness among the general public and testing for characteristics associated with awareness.
- The survey was carried out shortly after media coverage of the announcement began, when awareness and knowledge were likely to be at their highest.
- Associations between awareness of media coverage and e.g. greater worry about breast cancer and lower trust in the NHS were not apparent but Type II error cannot be excluded.
- Tests for associations between awareness of media coverage and screening behaviour were based on intended future uptake; actual uptake may differ.

INTRODUCTION

On 2nd May 2018, the Health Secretary in Great Britain, Jeremy Hunt, made an unanticipated statement to the House of Commons regarding *“a serious failure...in the national Breast Screening Programme”*. Mr Hunt stated that since 2009, *“a computer algorithm failure”* had resulted in approximately 450,000 women not being invited to their final regular breast screening appointment (i.e. when they were aged 68 to 71 years). He indicated to the House that *“[the] current best estimate based on statistical modelling...is that there may be between 135 and 270 women who had their lives shortened as a result”* and that women affected *“will automatically be sent an invitation to a catch-up screening”*.¹ News of this statement was reported extensively in the national media (e.g. ²⁻⁴) and prompted a volume of follow-up commentary from academics aiming to add context to this story. For example, some raised arguments that breast screening has no effect on all-cause mortality and risks resulting in overdiagnosis.⁵⁻⁶

Awareness of health-related media coverage is likely to be very high among academics and clinicians who are professionally invested in the topic. However, research is lacking on the prevalence of awareness of this type of news among the general public. In the absence of empirical data, it might be hypothesised to be either high (e.g. because mainstream media coverage has an extremely wide reach) or generally low (because members of the public are more focused on their personal priorities or do not have a specific interest in health news).

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3 Levels of public awareness of health media coverage is significant because it represents the
4 proportion of people who may be influenced by it: previous research has found that media coverage
5 of cancer-related stories in the United Kingdom has appreciable public health implications. For
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7 example, there is evidence that the cervical cancer diagnosis and death of a young female celebrity,
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9 Jade Goody, influenced women's cervical cancer screening decisions and temporarily increased
10
11 uptake and diagnoses of high-grade cervical neoplasia.⁷⁻¹⁰ Similarly, uptake of the colorectal
12
13 screening programme increased following coverage of the United Kingdom Flexible Sigmoidoscopy
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15 Screening Trial.¹¹⁻¹² Comparable findings have been reported by studies of pre-planned media
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17 messages such as Public Health England's 'Be Clear on Cancer' campaigns, which aim to increase
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19 cancer symptom awareness. These were associated with an increase in symptomatic attendance at
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21 General Practices and referrals to secondary care.¹³⁻¹⁵
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25 In these cases, media coverage was associated with an increase in healthcare usage. However,
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27 news about an error in the screening programme may have had adverse effects, such as diminishing
28
29 trust in the National Health Service (with corresponding negative implications for help-seeking), more
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31 frequent worry about breast cancer, and being less inclined to have breast screening in future. To our
32
33 knowledge, this possibility has not been investigated by research to date.
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36 This study surveyed awareness of the coverage shortly after the announcement (when conscious
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38 recall was likely to be highest) in a large, sociodemographically diverse sample of the general public.
39
40 In order to make a more complete assessment of this awareness, we also measured knowledge of
41
42 the relevant statistics most commonly reported as part of the story (i.e. the number of women
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44 estimated to have missed an invitation and to have had their lives shortened) since these were a key
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46 factor in making a personal assessment of the scale and severity of the invitation errors. We also
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48 recognised that people's concerns about the initial coverage may have been moderated by follow-up
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50 commentary noting issues around overdiagnosis and all-cause mortality in breast screening. We used
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52 these measures to conduct an exploratory analysis of variables associated with awareness of the
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54 media coverage, including education, gender, and awareness of other news stories that were
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56 reported around the same time. We also tested the hypotheses that awareness of the breast
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58 screening media coverage would be associated with lower trust in participants' GPs and the NHS and
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3 (in women) more frequent worry about breast cancer and being less likely to intend to participate in
4 breast screening in future.
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7 **METHODS**

8 **Design**

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11 Institutional ethical approval was obtained (registration number: 2951/006). A market research agency
12 (Kantar TNS UK) collected data in two waves of sampling between 6th and 10th June 2018 (i.e. less
13 than six weeks after the initial news story. The survey questions formed one module within a weekly
14 face-to-face computer-assisted omnibus survey on a wider range of topics. Random location sampling
15 was used to identify target households based on the 2011 Census and Postcode Address File. At
16 each location, quotas were set with the aim of achieving national representativeness based on
17 working status, children in the household, gender, and age.
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21 The full survey is included in Appendix 1. Participants were initially shown a computer screen with text
22 introducing the study and asking for their consent to participate. They were also given an information
23 card containing debrief text and directions to further information about breast screening.
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27 **Participants**

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29 Eligible participants were all males and females in England aged 16 years or older who consented to
30 take part in this module of the survey. The sample includes women eligible for breast screening (i.e.
31 aged 47 to 73 years) and also members of the general population (males and females aged 16 years
32 or older) since it was hypothesised that awareness of the story had the potential to negatively affect
33 perceptions of other health services, irrespective of whether participants were affected directly.
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35 Sample size was based on budgetary constraints and the number of participants who could be
36 approached no more than six weeks after the initial news story.
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51 **Patient and public involvement**

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53 Since the results of the study were expected to be highly time-sensitive, rapid data collection was
54 prioritised over involving patients and the public in the design and conduct of the study. In order to
55 minimise data protection issues, survey responses were received by the research team in
56 anonymised format, meaning that it is not possible to disseminate study results to participants.
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Measures

Demographics:

General background information included participants' self-reported age (in years), gender, ethnic origin, marital status, education, social class grade,¹⁶ employment status, and urban or rural area type.

Cancer and breast screening experience, and attitudes towards screening:

Participants were asked whether they had been diagnosed with any of several types of cancer themselves. Women aged 47 years or older were also asked if they had ever been i) invited to and ii) participated in the Breast Screening Programme.

Participants were asked about their attitudes towards screening via a previously used question,¹⁷ *"routine screening means testing healthy people to find cancer before they have any symptoms. Do you think routine cancer screening tests for healthy people are almost always a good idea?"*.

Response options were "yes", "no", and "not sure".

Awareness of the breast screening news story:

Participants were asked to read a brief summary of the story (see Appendix 1, Q7), the main details of which were derived from the primary story on the topic on the BBC news website.⁴ This was followed by the question, *"do you recall seeing or hearing anything about this news story before now?"*.

Response options were "yes", "no", and "not sure".

It was anticipated that directions of associations with awareness may depend on the specific parts of the story of which participants were aware. Consequently, participants who reported being aware of the main news story were also asked about their awareness of issues relating to all-cause mortality and overdiagnosis using two further summaries (see Appendix 1, Q14 and Q15), derived from two sources.⁵⁻⁶

Questions for assessing awareness were the same as previous. Participants reporting awareness of the news story were also asked where they saw or heard it and whether they discussed or shared it

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3 with anyone else. They were also asked two questions on the key statistics reported based on the
4 following summaries:
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8 *“The Health Secretary, Jeremy Hunt, gave an estimate of the number of women who had failed to get*
9 *invitations since 2009.”*

10
11
12 *“The Health Secretary also gave an estimate, based on computer modelling, of the number of women*
13 *who may have had their lives shortened.”*
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17 For both, the question was *“which of the following do you think is the estimate that he gave?”*. For the
18 first question, response options consisted of the true estimate (450,000) and three alternatives that
19 were orders of magnitude higher or lower (4,500, 45,000, and 4,500,000). Similarly, response options
20 for the second question consisted of the correct answer (between 135 and 270) and alternatives that
21 were either an order of magnitude higher (1,350 and 2,700), lower (13 and 27), or both higher and
22 lower (13 and 2,700). Response order was presented in one of two different ways for each participant
23 (determined at random) to reduce potential order effects.
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31 Awareness of news stories unrelated to breast screening:
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34 Awareness of other news stories was measured by asking participants to read two further summaries
35 (one on a volcano eruption in Hawaii; one on local council elections in England; see Appendix 1, Q19
36 and Q20). This was followed by the same measure of awareness as in previous questions. Main
37 details were derived from the primary stories on the BBC news website.¹⁸⁻¹⁹ These two stories were
38 selected for comparison because they were reported around the same time and also consisted of
39 specific, definable events.
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47 Trust in health services:
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49 Participants were asked two questions based on previously used items,²⁰⁻²¹ *“in general, how much do*
50 *you trust...”* i) *“...your general practitioner?”* and ii) *“...the NHS?”*. Response options for both were
51 *“not at all”, “a little”, “somewhat”, “a lot”, and “not sure”*.
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56 Frequency of breast cancer worry:
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3 Breast cancer worry (among women) was measured using an item based on one previously used,²²
4 “how often do you worry about your chances of getting breast cancer yourself?”. Response options
5 were, “never”, “occasionally”, “sometimes”, “often”, “very often”, “not sure”, and “prefer not to say”.
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10 Breast screening intentions:

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12 Women aged 16 to 69 years were asked, “do you think you will go for breast screening when you are
13 next offered it?”. Response options were “yes, definitely”, “yes, probably”, “no, probably not”, and “no,
14 definitely not”.
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18 19 **Analysis**

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21 Participant characteristics and awareness about the news stories are reported using descriptive
22 statistics. Responses of “prefer not to say” were excluded, as were responses of “not sure” for ordinal
23 variables. Other responses of “not sure”, were grouped with “no”. Ethnicity was dichotomised into
24 “white British” and “other groups”; social class grades were grouped into “A or B”, “C1”, “C2”, and “D
25 or E”. For education, “trade apprenticeships” were grouped with “other qualifications”. Responses to
26 measures of invitations to and participation in breast screening were coded into “not eligible or not
27 invited”, “invited, never taken part”, and “taken part”.
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36 One exploratory regression model tested for variables potentially associated with whether people
37 responded to the survey. Three exploratory regression models tested for variables potentially
38 associated with i) awareness of the breast screening news; and stating correctly the number of
39 women who were ii) not invited for screening and iii) estimated to have had their lives shortened. A
40 further four regression models tested the null hypotheses that awareness of the breast screening
41 news story was not associated with trust in iv) participants’ GPs and v) the NHS in the whole sample;
42 and vi) frequency of worry about breast cancer and vii) intentions to participate in breast screening in
43 future among women aged 70 years or less, after adjusting for covariates.
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52 For the model assessing variables associated with responding to the questionnaire, the main
53 variables of interest were recruitment wave, gender, ethnicity, marital status, social class grade,
54 employment status, area type, and age (since these were the variables where data were available for
55 both participants and non-participants). For the four main exploratory models and hypothesis testing
56 models, independent variables were as above with the addition of other available measures (listed in
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3 tables) where multi-collinearity was not an appreciable issue (i.e. Variance Inflation Factors <10). Age
4 was included in models as either a continuous variable or divided into age groups (where a Box-
5 Tidwell procedure found evidence that the assumption of linearity was not met; $p < .05$). Frequency of
6 worry about breast cancer was also included in the model of future breast screening intentions.
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11 For models testing hypotheses, responses on measures of awareness of the breast screening story
12 were coded into a single nominal variable with five levels: 1) *“unaware of the story”*, 2) *“aware of the*
13 *main story only”*, 3) *“aware of the main story and all-cause mortality follow-up commentary”*, 4) *“aware*
14 *of the main story and overdiagnosis follow-up commentary”*, 5) *“aware of the main story and both*
15 *follow-up commentaries”*.
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22 Ordinal logistic regression was attempted in the first instance where dependent variables were
23 ordinal. Tests of parallel lines suggested that the assumption of proportional odds was generally not
24 met ($p < .0005$) and there were few cases in some cells. Hence, dependent variables were
25 dichotomised and binary logistic regression was used. Participants with missing data on variables of
26 interest were not included in models.
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32 **RESULTS**

33 **Participant characteristics**

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38 2,681 participants began the survey module. 787 (29.4%) opted out, leaving 1,894 participants who
39 provided data. Mean age was 50.8 years (standard deviation: 20.5). Characteristics are described in
40 Appendix 2 (Table A). Response to the survey module questions was associated with all variables in
41 the model, except for area type (Appendix 2, Table B). Participants of the omnibus survey
42 approached were more likely to respond to this survey module if they were invited in wave 1 (vs. wave
43 2), female (vs. male), white British (vs. other groups), married, living as a couple, or widowed,
44 divorced or separated (vs. single), in higher social class grades (vs. grades D or E), working (vs. not
45 working), and younger.
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54 **Awareness of news stories, sources of information, and variables associated with awareness** 55 **of the breast screening media coverage** 56 57 58 59 60

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3 1,264/1,894 (66.7%) reported being aware of the main news story (Appendix 2, Table A) and
4 relatively few reported being aware of follow-up commentaries: 438/1,264 (34.7%) and 367/1,264
5 (29.0%) recognised the commentaries on all-cause mortality and overdiagnosis, respectively.
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7 250/1,264 (19.8%) were aware of both. 971/1,264 (76.8%) and 271/1,264 (21.4%) encountered the
8 story on television and radio, respectively (participants could select more than one). 169/1,264
9 (13.4%) and 134/1,264 (10.6%) encountered the story in print newspapers and online news websites
10 (Appendix 2, Table C). Other news sources were used relatively rarely e.g. 68/1,264 (5.4%) heard the
11 story from social media websites. 450/1,264 (35.6%) reported discussing or sharing the story with
12 someone else.
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21 Participants were more likely to be aware of the story if they were aware of either of the other two
22 news stories. Awareness of the three stories was highly interrelated: 824/1,894 participants (43.5%)
23 were aware of all three news stories and a further 196/1,894 (10.3%) reported not being aware of any.
24 Only 323/1,894 (17.1%) were aware of just one of the three stories and only 106/1,894 participants
25 (5.6%) were aware of the news about breast screening, specifically. Participants were also more likely
26 to be aware of the breast screening news story if they were white British, older, had higher levels of
27 education or social class grade. Participants were less likely to be aware if they believed that
28 screening was almost always a good idea. All other p-values were $\geq .207$ (Table 1).
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37 **Awareness of statistics from the breast screening media coverage and variables associated** 38 **with awareness among participants who reported being aware of the story**

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42 Only 233 (18.4%) of the 1,264 participants who reported being aware of the story correctly recognised
43 the number of women who had not been invited and only 268 (21.2%) correctly recognised the
44 estimated number of women who had their lives shortened. 809 (64.0%) did not correctly identify
45 either statistic and only 3.6% correctly identified both (Table 2). The model testing for demographic
46 and psychological variables associated with correctly identifying either set of statistics found only
47 weak evidence against the null hypothesis for all characteristics (p-values were $\geq .087$ and $\geq .062$ in the
48 respective models; data not shown).
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56 **Awareness of media coverage and participants' trust their GPs and the NHS**

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3 In both these models, there was only weak evidence against the null hypothesis. Table 3 shows the
4 main results of binary logistic regression models consisting of 1,746 participants ($p=.729$ and $.290$).
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6 Full results of the model are presented in Appendix 2 (Table D and Table E).
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10 **Awareness of media coverage and frequency of worry about breast cancer**

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12 Table 4 shows that there was only weak evidence against the null hypothesis ($n=700$; $p=.198$). Full
13 results are included in Appendix 2 (Table F).
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17 **Awareness of media coverage and future breast screening intentions**

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19 Table 5 shows that there was only weak evidence against the null hypothesis for this analysis ($n=700$;
20 $p=.108$). Full results are included in Appendix 2 (Table G).
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24 Numbers of participants with missing data for each variable are shown in Appendix 2 (Table H).
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Table 1 – Full results of the binary logistic regression model testing for variables associated with awareness of the breast screening news story

		Aware vs. Not aware of the breast screening story (or not sure): n (%)		Adjusted OR, 95% CI	p-value
Characteristic	Total (n=1,792)	Not aware/sure (n=587; 32.8%)	Aware (n=1,205; 67.2%)	Aware of the screening story (vs. Not aware or not sure)	
Recruitment wave					
Wave 2: 20-26 th June	570	185 (32.5)	385 (67.5)	1.02, 0.79 to 1.31	.907
vs. Wave 1: 6-10 th June	1,222	402 (32.9)	820 (67.1)		
Age					Overall: <.0005
65+	549	111 (20.2)	438 (79.8)	7.77, 4.52 to 13.38	<.0005
55-64	252	53 (21.0)	199 (79.0)	6.75, 3.92 to 11.63	<.0005
45-54	241	47 (19.5)	194 (80.5)	7.70, 4.56 to 13.00	<.0005
35-44	248	88 (35.5)	160 (64.5)	3.60, 2.22 to 5.84	<.0005
25-34	275	142 (51.6)	133 (48.4)	2.00, 1.27 to 3.14	.003
vs. 16-24	227	146 (64.3)	81 (35.7)		
Gender					
Male	771	234 (30.4)	537 (69.6)	1.00, 0.74 to 1.35	.999
vs. Female	1,021	353 (34.6)	668 (65.4)		
Ethnicity					
White British	1,491	415 (27.8)	1,076 (72.2)	3.00, 2.20 to 4.09	<.0005
vs. Other groups	301	172 (57.1)	129 (42.9)		
Marital status					Overall: .914
Married/Living as a couple	985	279 (28.3)	706 (71.7)	1.07, 0.78 to 1.47	.672
Widowed/Divorced/Separated	354	84 (23.7)	270 (76.3)	1.06, 0.70 to 1.60	.792
vs. Single	453	224 (49.4)	229 (50.6)		
Highest level of education					Overall: .001
Graduate level/Above	501	131 (26.1)	370 (73.9)	2.08, 1.34 to 3.23	.001
A-levels/AS levels/Equivalentents	448	162 (36.2)	286 (63.8)	1.80, 1.19 to 2.73	.006
GCSEs/Equivalentents	440	156 (35.5)	284 (64.5)	1.36, 0.92 to 2.00	.120
Trade apprenticeships/Other	89	39 (43.8)	50 (56.2)	0.75, 0.42 to 1.32	.316
vs. No formal qualifications	314	99 (31.5)	215 (68.5)		
Social class grade					Overall: <.0005
Grade A or B	326	53 (16.3)	273 (83.7)	2.44, 1.59 to 3.73	<.0005
Grade C1	511	165 (32.3)	346 (67.7)	1.41, 1.02 to 1.95	.037
Grade C2	394	142 (36.0)	252 (64.0)	1.13, 0.81 to 1.58	.469
vs. Grade D or E	561	227 (40.5)	334 (59.5)		
Employment status					
Working	823	287 (34.9)	536 (65.1)	0.91, 0.68 to 1.22	.909
vs. Not working	969	300 (31.0)	669 (69.0)		
Area type					
Urban	1,458	476 (32.6)	982 (67.4)	1.21, 0.90 to 1.64	.207
vs. Rural	334	111 (33.2)	223 (66.8)		
Personal diagnosis of cancer					
Yes	150	34 (22.7)	116 (77.3)	1.18, 0.74 to 1.86	.490
vs. No	1,642	553 (33.7)	1,089 (66.3)		
Personal experience of breast screening					Overall: .552
Taken part	425	90 (21.2)	335 (78.8)	0.92, 0.60 to 1.41	.705
Invited, never taken part	55	13 (23.6)	42 (76.4)	0.66, 0.32 to 1.39	.276
vs. Not eligible or not invited	1,312	484 (36.9)	828 (63.1)		
Belief that screening is almost always a good idea					
Yes	1,649	547 (33.2)	1,102 (66.8)	0.59, 0.38 to 0.94	.025
vs. No or not sure	143	40 (28.0)	103 (72.0)		
Awareness of volcano news					
Yes	1,367	325 (23.8)	1,042 (76.2)	3.14, 2.39 to 4.12	<.0005
vs. No or not sure	425	262 (61.6)	163 (38.4)		
Awareness of election news					
Yes	1,138	292 (25.7)	846 (74.3)	1.37, 1.06 to 1.75	.014
vs. No or not sure	654	295 (45.1)	359 (54.9)		
General level of trust in the NHS					Overall: .485
A lot	969	308 (31.8)	661 (68.2)	0.59, 0.29 to 1.18	.132

1	Somewhat	599	193 (32.2)	406 (67.8)	0.63, 0.31 to 1.27	.196
2	A little	169	69 (40.8)	100 (59.2)	0.58, 0.27 to 1.25	.166
3	vs. Not at all	55	17 (30.9)	38 (69.1)		

Table 2 – Descriptive statistics of participants' responses about key statistics in the breast screening media coverage; correct responses were "450,000" and "135-270"

n (% of total; 95% CI) (n=1,264)

10	Number of women who did not receive their final invitation...	Number of women who may have had their life shortened. Between...					
11		135 - 270	13 - 27	13 - 2,700	1,350 - 2,700	Not sure	Total
12	450,000	46 (3.6)	6 (0.5)	79 (6.3)	71 (5.6)	31 (2.5)	233 (18.4)
13	4,500	68 (5.4)	20 (1.6)	28 (2.2)	22 (1.7)	30 (2.4)	168 (13.3)
14	45,000	130 (10.3)	22 (1.7)	76 (6.0)	86 (6.8)	54 (4.3)	368 (29.1)
15	4,500,000	3 (0.2)	1 (0.1)	10 (0.8)	20 (1.6)	4 (0.3)	38 (3.0)
16	Not sure	21 (2.1)	5 (0.4)	15 (1.2)	12 (0.9)	404 (32.0)	457 (36.2)
17	Total	268 (21.2)	54 (4.3)	208 (16.5)	211 (16.7)	523 (41.4)	

Table 3 – Testing for an association between awareness of the breast screening media coverage and trust in i) participants' GPs and ii) the NHS*

27	General level of trust in participants' GPs	A lot vs. Not at all; a little; somewhat: n (%)		Adjusted OR, 95% CI	p-value	
28		Less than a lot	A lot	A lot		
29	Total (n=1,746)	(n=781; 44.7%)	(n=965; 55.3%)	(vs. Less than a lot)		
30	Screening story awareness				Overall: .729	
31	Aware of the main story and both follow-up commentaries	238	98 (41.2)	140 (58.8)	1.10, 0.74 to 1.64	.653
32	Aware of the main story and overdiagnosis follow-up	172	66 (38.4)	106 (61.6)	1.31, 0.85 to 2.03	.218
33	Aware of the main story and all-cause mortality follow-up	107	49 (45.8)	58 (54.2)	1.21, 0.73 to 2.02	.459
34	Aware of the main story only	655	280 (42.7)	375 (57.3)	1.17, 0.88 to 1.57	.283
35	vs. Unaware of the story	574	288 (50.2)	286 (49.8)		
36	General level of trust in the NHS					Overall: .290
37	Total (n=1,746)	Less than a lot (n=803; 46.0%)	A lot (n=943; 54.0%)	A lot (vs. Less than a lot)		
38	Aware of the main story and both follow-up commentaries	238	102 (42.9)	136 (57.1)	0.87, 0.59 to 1.30	.503
39	Aware of the main story and overdiagnosis follow-up	172	76 (44.2)	96 (55.8)	0.78, 0.51 to 1.21	.267
40	Aware of the main story and all-cause mortality follow-up	107	57 (53.3)	50 (46.7)	0.58, 0.35 to 0.97	.039
41	Aware of the main story only	655	299 (45.6)	356 (54.4)	0.81, 0.60 to 1.09	.160
42	vs. Unaware of the story	574	269 (46.9)	305 (53.1)		

*Results are adjusted based on the following covariates: Recruitment wave, Age (Age group in the model of trust in the NHS), Gender, Ethnicity, Marital status, Highest level of education, Social class grade, Employment status, Area type, Personal diagnosis of cancer, Personal experience of breast screening, Belief that screening is almost always a good idea, Awareness of volcano news, Awareness of election news, General level of trust in the NHS (General level of trust in participants' GPs in the model of trust in the NHS). Full results of the model are reported in the Appendix

Table 4 – Testing for an association between awareness of the breast screening media coverage and frequency of worry about breast cancer*

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Characteristic	Total (n=700)	Never; occasionally vs. Sometimes; often; very often: n (%)		Adjusted OR, 95% CI	p-value
		Never; occasionally (n=441; 63.0%)	Sometimes; often; very often (n=259; 37.0%)	Sometimes; often; very often (vs. Never; occasionally)	
Screening story awareness					Overall: .198
Aware of the main story and both follow-up commentaries	88	65 (73.9)	23 (26.1)	0.85, 0.46 to 1.58	.614
Aware of the main story and overdiagnosis follow-up	63	42 (66.7)	21 (33.3)	1.05, 0.55 to 2.01	.878
Aware of the main story and all-cause mortality follow-up	36	25 (69.4)	11 (30.6)	1.10, 0.49 to 2.49	.819
Aware of the main story only	270	153 (56.7)	117 (43.3)	1.49, 0.98 to 2.25	.062
vs. Unaware of the story	243	156 (64.2)	87 (35.8)		

*Results are adjusted for covariates: Recruitment wave, Age, Ethnicity, Marital status, Highest level of education, Social class grade, Employment status, Area type, Personal diagnosis of cancer, Personal experience of breast screening, Belief that screening is almost always a good idea, Awareness of volcano news, Awareness of election news, General level of trust in participants' GPs, General level of trust in the NHS, Breast screening intentions for next invitation. Full results of the model are reported in the Appendix

Table 5 – Testing for an association between awareness of the breast screening media coverage and breast screening intentions*

Characteristic	Total (n=700)	Yes, definitely vs. Yes, probably; no, probably not; no, definitely not: n (%)		Adjusted OR, 95% CI	p-value
		No definite intention (n=99; 14.1%)	Definite intention (n=601; 85.9%)	Definite intention (vs. No definite intention)	
Screening story awareness					Overall: .108
Aware of the main story and both follow-up commentaries	88	10 (11.4)	78 (88.6)	2.01, 0.74 to 5.48	.172
Aware of the main story and overdiagnosis follow-up	63	4 (4.3)	59 (93.7)	2.66, 0.79 to 8.89	.113
Aware of the main story and all-cause mortality follow-up	36	6 (16.7)	30 (83.3)	0.66, 0.20 to 2.13	.486
Aware of the main story only	270	22 (8.1)	248 (91.9)	1.88, 0.99 to 3.57	.054
vs. Unaware of the story	243	57 (23.5)	186 (76.5)		

*Results are adjusted for covariates: Recruitment wave, Age group, Ethnicity, Marital status, Highest level of education, Social class grade, Employment status, Area type, Personal diagnosis of cancer, Personal experience of breast screening, Belief that screening is always a good idea, Awareness of volcano news, Awareness of election news, General level of trust in participants' GPs, General level of trust in the NHS, Frequency of worry about breast cancer. Full results of the model are reported in the Appendix

DISCUSSION

Previous studies have found evidence that media messages can increase usage of a range of healthcare services (e.g. ^{7-10, 12-15}). Awareness of this story about errors in the breast screening programme was hypothesised to have the potential for a range of negative effects. However, the results of this study did not provide strong evidence against the null hypothesis for any associations tested. To the extent that these results reflect an absence of harms, this is reassuring: we did not find evidence that awareness of the story reduced trust in the NHS or participants' GPs, increased frequency of worry about breast cancer, or negatively affected future breast screening intentions. If this is the case, it may be partly attributable to the news story saying little to reduce the perceived benefits of breast screening itself, in contrast to media coverage of e.g. the independent review of breast cancer screening, which reported on the issue of overdiagnosis extensively.²³⁻²⁴ Relatedly, the present study found that awareness was notably lower for follow-up commentaries on the shortcomings of breast screening, compared with the main story. In addition, the framing of the story may have been expected to reinforce the perceived benefits of screening by indicating that missing screening had negative consequences in terms of additional breast cancer deaths.

Population awareness of the breast screening news story was generally high. Television and radio were the main sources of information, broadly consistent with patterns of how most news is accessed, although the internet was used less often than observed in previous surveys.²⁵

Although no associations were found here, this finding is useful since it provides an estimate of the proportion of people who may be influenced by media coverage that does have positive or negative effects on health behaviour.^{7-10, 12-15} In the absence of this study, a plausible rationale

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9 could have been found for why this estimate would be higher or lower than was shown to be the
10 case.
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13 Awareness of this story was related to awareness of other news stories, suggesting that an
14 appreciable proportion of the population can be broadly dichotomised into those who are
15 generally “news aware” and “news unaware”. These results do not suggest that a notable
16 proportion of the public are aware of health news, specifically. In contrast to these findings,
17 recall of the main statistics was markedly low and correct responses may be largely attributable
18 to random guessing.¹ In some respects, this is surprising since the statistics were an integral
19 part of the story and often part of headlines (e.g. ^{2-4, 26}) and may be a cause for concern: the
20 number of women affected and estimated to have died as a result are important pieces of
21 information in order for an individual to make a personal assessment of the scale and severity of
22 the news. This finding may suggest that people either tend not to attend to or memorise this
23 statistical information (meaning that they would not be able to factor it into their appraisal of the
24 significance of the story) or they retain only the ‘gist’ of the statistics involved.²⁷ Awareness of
25 the breast screening story was greater among those with higher levels of education and social
26 class grade, those who were white British, and those who were older. Awareness of the breast
27 screening news story was also lower among participants with positive attitudes towards
28 screening (who may have been less likely to attend to a negative story).
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50 ¹ Participants were asked additional questions on the extent to which they trusted the statistics
51 and their reasons for not trusting them (if applicable). However, since responses were highly
52 suggestive of random guessing, no further analyses of these measures were attempted.
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9 This study has limitations. Despite the large sample size and adjustment for a range of
10 potentially confounding variables, some odds ratios could not be estimated with a high degree
11 of precision. Confidence intervals were wide for key variables, meaning that associations may
12 not have been detected if they were real but smaller than observed. In addition, our measures
13 did not include a question on trust in the Breast Screening Programme, specifically, meaning
14 that we could not test for associations with this outcome. Findings on screening uptake also
15 relate only to anticipated future behaviour; future research could build on this study by
16 assessing whether the announcement was followed by a decrease (or increase) in actual
17 screening uptake. Although the response rate to this survey was higher than others of its type
18 (e.g. 71% in the present study vs. 42% reported by Low et al.),²⁸ members of the public were
19 also less likely to participate in the survey module based on a range of characteristics for which
20 data were available. Results may be biased, insofar as responses differed based on these
21 variables or unmeasured participant characteristics that may have reduced population-
22 representativeness of the sample.
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35 36 **Conclusions**

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39 This study found that news of errors in the Breast Screening Programme in England had
40 reached a large proportion of the general public and that those aware of the media coverage
41 tended to be those aware of news stories in general. The proportion of people aware was also
42 higher among those who had more education, were in a higher social class grade, or were
43 older. In contrast, awareness of key statistics from the story was very low among participants
44 aware of the story, even less than six weeks after the onset of the main media coverage. The
45 results of this study did not provide evidence that media coverage had any effects on trust in
46 aspects of the health service among the general public, or worry about breast cancer or breast
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9 screening intentions among women. Future research should investigate possible effects of
10 media coverage using objective measures of screening behaviour.

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13 **Contributors:** AG, CVW, and JW conceived and designed the study. AG analysed the data.
14 AG, CVW, and JW participated in the interpretation of results. AG, CVW, and JW drafted the
15 manuscript, participated in critical revision, and approved the final version. Patients and the
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50 **Competing interests:** None declared.

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53 **Patient consent:** Obtained.

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Data sharing: No additional data are available.

For peer review only

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For peer review only

APPENDIX 1 - SURVEY

[All Adults 16+ in England. Participants were shown the tablet screen and the following text was read out by interviewers]

Q.A In this part of the survey, I am going to ask you some questions related to health, including cancer, and recent news stories. These questions are asked on behalf of researchers from University College London. If you do not wish to answer a particular question during any part of this survey, you may refuse to answer and we will move to the next question. All your answers will be kept strictly confidential and you will be anonymous to the researchers.

The NHS currently offers breast cancer screening with mammography once every three years, to women aged between about 50 to 70 years in England.

Are you okay to continue with these questions?

1: Yes

2: No

As the questions can be perceived as sensitive, you can answer the questions on this machine yourself. I would now like to show you how to use the machine by going through a practice question with you.

[All Adults 16+ in England willing to continue. "Don't know"/"Not sure"/"Prefer not to say" appeared at the top of the screen, out of view of participants, except for questions that participants completed themselves. Interviewers showed the screen to participants]

This is an example of a single-coded question

Q.B What is your favourite colour?

1: Red

2: Yellow

1
2
3 3: Blue
4

5
6 4: Green
7

8 Other colour (PEN -WRITE IN)
9

10
11 Don't know
12

13
14 Refused
15

16
17
18
19 [All females aged 16-69 in England willing to continue. Interviewers handed tablets to participants and
20 stepped away from viewing the screen]
21

22
23
24 Q.1 Do you think you will go for breast screening when you are next offered it? REMEMBER TO TAP
25 OK TO CONTINUE
26

27
28
29 1: Yes, definitely
30

31 2: Yes, probably
32

33 3: No, probably not
34

35 4: No, definitely not
36

37
38
39 Not sure
40

41
42 Prefer not to say
43
44

45
46
47
48 [All females aged 47+ in England willing to continue]
49

50
51 Q.2 Have you ever been invited for breast screening before? If you've only ever been offered a
52 mammogram to investigate symptoms separately to the screening programme, please respond 'no'.
53

54
55 1: Yes
56

57
58 2: No
59
60

1
2
3 Not sure
4

5
6 Prefer not to say
7
8
9

10
11 [All females aged 47+ in England who have been invited for breast screening before]
12

13
14 Q.3 Have you ever been for breast screening as part of the screening programme?
15

16
17 1: Yes
18

19
20 2: No
21

22
23 Not sure
24

25
26 Prefer not to say
27
28
29

30
31 [All Adults 16+ in England willing to continue. This question allowed more than one response option.
32

33 "None of the above"/"Prefer not to say" were mutually exclusive with other responses]
34

35
36 Q.4 Which of the following, if any, have you been diagnosed with? Please choose all that apply.
37

38
39 1: Bowel cancer
40

41
42 2: Lung cancer
43

44
45 3: Breast cancer
46

47
48 4: Cervical cancer
49

50
51 5: Prostate cancer
52

53 Other type of cancer - PEN WRITE IN
54

55
56 None of the above
57

58
59 Prefer not to say
60

1
2
3 [All Adults 16+ in England willing to continue. This question allowed more than one response option.

4
5 "None of the above"/"Prefer not to say" were mutually exclusive with other responses]

6
7
8 Q.5 Has anyone you know ever been diagnosed with breast cancer? Please choose all that apply.

9
10
11
12
13 1: A close family member

14
15
16 2: Any other family member

17
18
19 3: A friend

20
21
22 4: A colleague

23
24
25 5: Any other person

26
27 Not sure

28
29
30 Prefer not to say

31
32
33
34
35 [All females aged 16+ in England willing to continue]

36
37
38 Q.6 How often do you worry about your chances of getting breast cancer yourself?

39
40
41 1: Never

42
43
44 2: Occasionally

45
46
47 3: Sometimes

48
49
50 4: Often

51
52
53 5: Very often

54
55 Not sure

56
57 Prefer not to say

58
59
60 Thank you for answering these questions - this is the end of this section for you.

1
2
3
4
5
6 [All Adults 16+ in England willing to continue. Participants handed the tablet back to the interviewer,
7 who showed the screen and either read out or allowed participants to read subsequent questions]
8
9

10 Q.7 In May, it was reported that a computer algorithm failure had meant that a number of women did
11 not receive invitations to their final routine breast cancer screening. The Health Secretary, Jeremy
12 Hunt, said that women affected will be contacted by letter with an invitation for a catch-up screening
13 test but some of the women who were not invited for their final appointment may have had their lives
14 shortened.
15
16
17
18
19

20 Do you recall seeing or hearing anything about this news story before now?
21
22

23 1: Yes
24

25 2: No
26
27

28 Not sure
29
30
31
32
33
34

35 [All who recall seeing or hearing anything about this news story before now. This was a multiple
36 choice question. The order of response options was randomised with “other websites” always
37 following both “online news websites” and “social media websites”]
38
39
40

41 Q.8 Do you recall where you saw or heard this news story? Please choose all that apply.
42
43

44 1: Television
45

46 2: Print newspaper(s)
47
48

49 3: Radio
50
51

52 4: Online news websites
53
54

55 5: Social media websites
56
57

58 6: Other websites
59
60

1
2
3 7: Word of mouth
4

5
6 Other sources – PEN WRITE IN
7

8 Not sure
9
10
11
12
13

14 [All who recall seeing or hearing anything about this news story before now]
15

16
17 Q.9 Did you discuss or share the story with anyone else?
18

19 1: Yes
20

21
22 2: No
23

24
25 Not sure
26
27
28
29

30
31 [All who recall seeing or hearing anything about this news story before now. Participants were
32 randomised to one of two orders of response options (1:1)]
33

34
35 Q.10 The Health Secretary, Jeremy Hunt, gave an estimate of the number of women who had failed
36 to get invitations since 2009.
37

38
39
40 Which of the following do you think is the estimate that he gave?
41

42 1: 4,500 women
43

44
45 2: 45,000 women
46

47
48 3: 450,000 women
49

50
51 4: 4,500,000 women
52

53 Not sure
54
55
56
57
58
59
60

1
2
3 [All who recall seeing or hearing anything about this news story before now. Participants randomised
4 to one of two orders of response options (1:1)]
5
6

7
8 Q.11 The Health Secretary also gave an estimate, based on computer modelling, of the number of
9 women who may have had their lives shortened.
10

11
12 Which of the following do you think is the estimate that he gave?
13

14
15 1: Between 13 and 27 women
16

17
18 2: Between 135 and 270 women
19

20
21 3: Between 13 and 2,700 women
22

23
24 4: Between 1,350 and 2,700 women
25

26
27 Not sure
28
29
30
31

32 [All who gave an estimate in Q1 or Q11]
33

34 Q.12 How much did you trust these statistics when you heard them in the news?
35
36

37 1: Not at all
38

39
40 2: A little
41

42
43 3: Somewhat
44

45
46 4: A lot
47

48
49 Not sure
50
51
52

53 [All who do not trust the statistic]
54

55
56 Q.13 What were your reasons for not trusting these statistics when you heard them in the news?
57
58

59 PROBE: Any other reasons?
60

1
2
3 OPEN ENDED
4
5
6
7

8 [All who recall seeing or hearing anything about this news story before now]
9

10
11 Q.14 It was also reported that some health experts have said breast cancer screening can do “more
12 harm than good” because they believe “breast screening...has no impact on all-cause death”.
13
14

15
16 Do you recall seeing or hearing anything about this aspect of the news story before now?
17

18
19 1: Yes
20

21
22 2: No
23

24
25 Not sure
26
27
28
29

30 [All who recall seeing or hearing anything about this news story before now]
31

32 Q.15 The estimate of the number of women who may have had their lives shortened that the Health
33 Secretary gave was between 135 and 270. It was also reported that one statistics expert has said this
34 claim is “misleading” because they believe “there is only weak evidence that screening helps prolong
35 life, particularly for older women” and that “contrary to popular belief, screening also does harm...for
36 every 200 women attending screening between 50 and 70, we would expect one to have her early
37 death from breast cancer prevented, but three to be unnecessarily treated for a harmless cancer that
38 would not have troubled them”.
39
40
41
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49

50 Do you recall seeing or hearing anything about this aspect of the news story before now?
51

52
53 1: Yes
54

55
56 2: No
57

58
59 Not sure
60

1
2
3
4
5
6 [All Adults 16+ in England willing to continue]
7

8 Q.16 In general, how much do you trust your general practitioner?
9

10
11 1: Not at all
12

13
14 2: A little
15

16
17 3: Somewhat
18

19
20 4: A lot
21

22
23 Not sure
24
25
26
27

28 [All Adults 16+ in England willing to continue]
29

30 Q.17 In general, how much do you trust the NHS?
31

32
33 1: Not at all
34

35
36 2: A little
37

38
39 3: Somewhat
40

41
42 4: A lot
43

44
45 Not sure
46
47
48
49

50 [All Adults 16+ in England willing to continue]
51

52 Q.18 Routine screening means testing healthy people to find cancer before they have any symptoms.
53

54 Do you think routine cancer screening tests for healthy people are almost always a good idea?
55

56
57 1: Yes
58

59
60 2: No

1
2
3 Not sure
4
5
6
7

8 [Participants were handed an information card with the following text and asked to read it]
9

10
11 You may have some questions about breast cancer screening after this part of the survey. You can
12 find out more by calling the NHS on a Freephone number (0800 169 2692) or via the web on
13 <https://www.nhs.uk/conditions/breast-cancer-screening/missed-invitations/>.
14
15
16
17

18
19
20 [All Adults 16+ in England willing to continue]
21

22
23 Q.19 It was also reported in May that a volcano had erupted in Hawaii, leading to officials declaring a
24 state of emergency and mandatory evacuation of 1,700 residents in the area.
25

26
27 Do you recall seeing or hearing anything about this news story before now?
28

29
30
31 1: Yes
32

33
34 2: No
35

36
37 Not sure
38
39
40
41

42 [All Adults 16+ in England willing to continue]
43

44
45 Q.20 The results of local elections held in England were also reported in May. The Labour Party won
46 2,350 seats, the Conservative Party won 1,332 seats, and the Liberal Democrats won 536 seats.
47

48
49 Do you recall seeing or hearing anything about this news story before now?
50

51
52 1: Yes
53

54
55 2: No
56

57
58 Not sure
59
60

1
2
3 [All Adults 16+ in England willing to continue]
4
5

6 Q.21 Please can I ask you what is the highest level of qualification you have received?
7

8 1: A. Graduate level qualifications and above: including higher degrees, professional qualifications at
9 HE standard (e.g. chartered accountant, surveyor, Nursing, Teaching), NVQ and SVQ Level 4 or 5,
10 Higher Education Diplomas, HNC and HND and BTEC Higher, RSA Higher Diploma
11
12

13
14
15 2: B. A-levels and AS levels and equivalents: including SCE Higher, Scottish Certificate 6th Year
16 Studies, NVQ and SVQ and GSVQ level 3, GNVQ Advanced, ONC and OND and BTEC National,
17 City and Guilds Advanced Craft, City and Guilds Final level or Part III, RSA Advanced Diploma
18
19

20
21
22 3: C. Trade apprenticeships
23

24
25 4: D. GCSEs and equivalents: including O level, SCE Standard, CSEs, NVQ and SVQ and GSVQ
26 level 1 and 2, GNVQ and BTEC and SCOTVEC first, General diploma, City and Guilds Ordinary level,
27 City and Guilds Ordinary level Part II, RSA State I-III or Diploma, SCOTVEC modules
28
29

30
31 5: E. Other qualifications (including overseas)
32

33
34 6: F. No formal qualifications
35

36 Don't know
37

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39 Refused
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APPENDIX 2 – SUPPLEMENTARY TABLES

Table A – Summary statistics describing the sample

Measure	Total* (n=1,894)	%	(95% CI)
Awareness of the news about breast screening			
Aware of the main story and both follow-up commentaries	250	13.2	11.7 to 14.8
Aware of the main story and overdiagnosis follow-up	188	9.9	8.6 to 11.3
Aware of the main story and all-cause mortality follow-up	117	6.2	5.2 to 7.3
Aware of the main story only	709	37.4	35.3 to 39.6
Unaware of the story	630	33.3	31.2 to 35.4
Recruitment wave			
Wave 2: 20-26 th June	606	32.0	29.9 to 34.1
Wave 1: 6-10 th June	1,288	68.0	65.9 to 70.1
Gender			
Male	801	42.3	40.1 to 44.5
Female	1,093	57.7	55.5 to 59.9
Ethnicity			
White British	1,555	82.4	80.7 to 84.1
Other groups	331	17.6	15.9 to 19.3
Marital status			
Married or living as a married	1,039	54.9	52.6 to 57.1
Widowed, divorced and separated	382	20.2	18.4 to 22.0
Single	473	25.0	23.1 to 27.0
Highest level of education			
Graduate level qualifications and above	530	28.2	26.2 to 30.3
A-levels and AS levels and equivalents	461	24.6	22.7 to 26.5
GCSEs and equivalents	459	24.5	22.5 to 26.4
Trade apprenticeships or other qualifications	93	5.0	4.0 to 6.0
No formal qualifications	334	17.8	16.1 to 19.6
Social class grade			
Grade A or B	336	17.7	16.1 to 19.5
Grade C1	539	28.5	26.5 to 30.5
Grade C2	423	22.3	20.5 to 24.3
Grade D or E	596	31.5	29.4 to 33.6
Employment status			
Working	862	45.5	43.3 to 47.8
Not working	1,032	54.5	52.2 to 56.7
Area type			
Urban	1,542	81.4	79.6 to 83.1
Rural	352	18.6	16.9 to 20.4
Personal diagnosis of cancer			
Yes	156	8.4	7.2 to 9.7
No	1,705	91.6	90.3 to 92.8
Personal experience of breast screening			
Taken part	441	23.7	21.8 to 25.7
Invited, never taken part	56	3.0	2.3 to 3.9
Not eligible or not invited	1,364	73.3	71.2 to 75.3
Belief that screening is almost always a good idea			
Yes	1,737	91.7	90.4 to 92.9
No or not sure	157	8.3	7.1 to 9.6
Awareness of the news about the volcanic eruption			
Yes	1,435	75.8	73.8 to 77.7
No or not sure	459	24.2	22.3 to 26.2
Awareness of the news about the local elections			
Yes	1,198	63.3	61.1 to 65.4
No or not sure	696	36.7	34.6 to 38.9
General level of trust in participants' GPs			
A lot	1,009	55.2	52.9 to 57.5
Somewhat	540	29.6	27.5 to 31.7
A little	219	12.0	10.6 to 13.5
Not at all	59	3.2	2.5 to 4.1
General level of trust in the NHS			

1	A lot	1,016	54.2	54.9 to 59.5
2	Somewhat	619	33.0	32.7 to 37.1
3	A little	184	9.8	9.0 to 11.8
4	Not at all	56	3.0	2.4 to 4.0
5	Frequency of worry about breast cancer			
6	Very often	46	4.6	3.4 to 6.0
7	Often	55	5.4	4.2 to 7.0
8	Sometimes	216	21.4	18.9 to 24.0
9	Occasionally	302	29.9	27.1 to 32.8
10	Never	391	38.7	35.7 to 41.7
11	Breast screening intentions for next invitation			
12	Yes, definitely	690	84.7	82.1 to 87.0
13	Yes, probably	88	10.8	8.8 to 13.1
14	No, probably not	18	2.2	1.4 to 3.4
15	No, definitely not	19	2.3	1.5 to 3.5

Table B – Full results of the binary logistic regression model testing for variables associated with whether participants responded to questions on the survey module

		Responded vs. Did not respond to the survey questions: n (%)		Adjusted OR, 95% CI	p-value
Characteristic	Total (n=2,665)	Did not respond (n=779; 29.2%)	Responded (n=1,886; 70.8%)	Responded to questions (vs. Did not respond)	
Recruitment wave					
Wave 2: 20-26 th June	908	303 (33.4)	605 (66.6)	0.73, 0.61 to 0.87	<.0005
vs. Wave 1: 6-10 th June	1,757	476 (27.1)	1,281 (72.9)		
Gender					
Male	1,270	474 (37.3)	796 (62.7)	0.46, 0.39 to 0.55	<.0005
vs. Female	1,395	305 (21.9)	1,090 (78.1)		
Ethnicity					
White British	2,139	584 (27.3)	1,555 (72.7)	1.69, 1.37 to 2.10	<.0005
vs. Other groups	526	195 (37.1)	331 (62.9)		
Marital status					Overall: .001
Married/Living as a couple	1,441	407 (28.2)	1,034 (71.8)	1.48, 1.18 to 1.85	.001
Widowed/Divorced/Separated	517	135 (26.1)	382 (73.9)		
vs. Single	707	237 (33.5)	470 (66.5)	1.65, 1.21 to 2.24	.002
Social class grade					Overall: .003
Grade A or B	450	115 (25.6)	335 (74.4)	1.54, 1.18 to 2.02	.002
Grade C1	726	190 (26.2)	536 (73.8)		
Grade C2	596	174 (29.2)	422 (70.8)	1.28, 1.01 to 1.63	.045
vs. Grade D or E	893	300 (33.6)	593 (66.4)		
Employment status					
Working	1,225	366 (29.9)	859 (70.1)	0.79, 0.65 to 0.97	.026
vs. Not working	1,440	413 (28.7)	1,027 (71.3)		
Area type					
Urban	2,164	629 (29.1)	1,535 (70.9)	1.14, 0.91 to 1.42	.246
vs. Rural	501	150 (29.9)	351 (70.1)		
Age (in years)	2,665	52.1 (21.0)	50.8 (20.5)	0.99, 0.98 to 1.00	<.0005

Table C – Sources of news about the breast screening story

Source of information	Total (n=1,264)	%	(95% CI)
Television	971	76.8	74.4 to 79.1
Radio	271	21.4	19.2 to 23.8
Print newspaper(s)	169	13.4	11.6 to 15.3
Online news websites	134	10.6	9.0 to 12.4
Social media websites	68	5.4	4.2 to 6.7
Other websites	11	0.9	0.5 to 1.5

Word of mouth	43	3.4	2.5 to 4.5
1 Other sources	8	0.6	0.3 to 1.2
2 Discussed or shared the	450	35.6	33.0 to 38.3
3 story with someone else			

Table D – Full results of the binary logistic regression model testing for an association between awareness of the breast screening media coverage and trust in participants' GPs

Characteristic	Total (n=1,746)	A lot vs. Not at all; a little; somewhat: n (%)		Adjusted OR, 95% CI (vs. Less than a lot)	p-value
		Less than a lot (n=781; 44.7%)	A lot (n=965; 55.3%)		
Screening story awareness					Overall: .729
Aware of the main story and both follow-up commentaries	238	98 (41.2)	140 (58.8)	1.10, 0.74 to 1.64	.653
Aware of the main story and overdiagnosis follow-up	172	66 (38.4)	106 (61.6)	1.31, 0.85 to 2.03	.218
Aware of the main story and all-cause mortality follow-up	107	49 (45.8)	58 (54.2)	1.21, 0.73 to 2.02	.459
Aware of the main story only	655	280 (42.7)	375 (57.3)	1.17, 0.88 to 1.57	.283
vs. Unaware of the story	574	288 (50.2)	286 (49.8)		
Recruitment wave					
Wave 2: 20-26 th June	557	255 (45.8)	663 (55.8)	0.81, 0.64 to 1.04	.097
vs. Wave 1: 6-10 th June	1,189	526 (44.2)	302 (54.2)		
Gender					
Male	754	317 (42.0)	437 (58.0)	1.15, 0.86 to 1.54	.334
vs. Female	992	464 (46.8)	528 (53.2)		
Ethnicity					
White British	1,450	614 (42.3)	836 (57.7)	1.17, 0.85 to 1.61	.328
vs. Other groups	296	167 (54.4)	129 (43.6)		
Marital status					Overall: .504
Married/Living as a couple	964	422 (42.8)	542 (56.2)	1.04, 0.77 to 1.42	.782
Widowed/Divorced/Separated	341	139 (40.8)	202 (59.2)	0.86, 0.57 to 1.29	.460
vs. Single	441	220 (49.9)	221 (50.1)		
Highest level of education					Overall: .056
Graduate level/Above	494	230 (46.6)	264 (53.4)	0.64, 0.42 to 0.98	.042
A-levels/AS levels/Equivalent	438	201 (45.9)	237 (54.1)	0.70, 0.46 to 1.06	.089
GCSEs/Equivalent	429	213 (49.7)	216 (50.3)	0.63, 0.43 to 0.94	.022
Trade apprenticeships/Other	86	41 (47.7)	45 (52.3)	0.44, 0.25 to 0.80	.007
vs. No formal qualifications	299	96 (32.1)	203 (67.9)		
Social class grade					Overall: .711
Grade A or B	317	128 (40.4)	189 (59.6)	1.20, 0.82 to 1.76	.342
Grade C1	505	231 (45.7)	274 (54.3)	1.02, 0.74 to 1.39	.923
Grade C2	385	181 (47.0)	204 (53.0)	0.97, 0.70 to 1.36	.874
vs. Grade D or E	539	241 (44.7)	298 (55.3)		
Employment status					
Working	806	411 (51.0)	395 (49.0)	0.82, 0.63 to 1.07	.135
vs. Not working	940	370 (39.4)	570 (60.6)		
Area type					
Urban	1,420	635 (44.7)	785 (55.3)	1.12, 0.84 to 1.50	.430
vs. Rural	326	146 (44.8)	180 (55.2)		
Personal diagnosis of cancer					
Yes	1,599	718 (44.9)	881 (55.1)	0.84, 0.55 to 1.28	.404
vs. No	147	63 (42.9)	84 (57.1)		
Personal experience of breast screening					Overall: .284
Taken part	411	159 (38.7)	252 (61.3)	1.33, 0.91 to 1.95	.145
Invited, never taken part	48	21 (43.8)	27 (56.3)	0.95, 0.46 to 1.98	.894
vs. Not eligible or not invited	1,287	601 (46.7)	686 (53.3)		

1	Belief that screening is almost always a good idea					
2	Yes	1,609	701 (43.6)	908 (56.4)	1.30, 0.85 to 1.97	.230
3	vs. No or not sure	137	80 (58.4)	57 (41.6)		
4	Awareness of volcano news					
5	Yes	1,332	565 (42.4)	767 (57.6)	1.04, 0.77 to 1.40	.789
6	vs. No or not sure	414	216 (52.2)	198 (47.8)		
7	Awareness of election news					
8	Yes	1,114	467 (41.9)	647 (58.1)	1.19, 0.93 to 1.54	.172
9	vs. No or not sure	632	314 (49.7)	318 (50.3)		
10	General level of trust in the NHS					Overall: <.0005
11	A lot	943	202 (21.4)	741 (78.6)	13.53, 6.65 to 27.54	<.0005
12	Somewhat	589	409 (69.4)	180 (30.6)	1.62, 0.80 to 3.31	.183
13	A little	163	130 (79.8)	33 (20.2)	1.00, 0.46 to 2.21	.994
14	vs. Not at all	51	40 (78.4)	11 (21.6)		
15	Age (in years)	1,746	46.9 (19.1)	53.9 (21.0)	1.01, 1.00 to 1.02	.087

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18 Table E – Full results of the binary logistic regression model testing for an association between awareness of the
19 breast screening media coverage and trust in the NHS
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23		A lot vs. Not at all; a little; somewhat:		Adjusted OR, 95% CI	p-value	
24		n (%)				
25	Total	Less than a lot	A lot	A lot		
26	(n=1,746)	(n=803; 46.0%)	(n=943; 54.0%)	(vs. Less than a lot)		
27	Screening story awareness				Overall: .290	
28	Aware of the main story and both follow-up commentaries	238	102 (42.9)	136 (57.1)	0.87, 0.59 to 1.30	.503
29	Aware of the main story and overdiagnosis follow-up	172	76 (44.2)	96 (55.8)	0.78, 0.51 to 1.21	.267
30	Aware of the main story and all-cause mortality follow-up	107	57 (53.3)	50 (46.7)	0.58, 0.35 to 0.97	.039
31	Aware of the main story only	655	299 (45.6)	356 (54.4)	0.81, 0.60 to 1.09	.160
32	vs. Unaware of the story	574	269 (46.9)	305 (53.1)		
33	Recruitment wave					
34	Wave 2: 20-26 th June	557	248 (44.5)	309 (55.5)	1.21, 0.95 to 1.55	.118
35	vs. Wave 1: 6-10 th June	1,189	555 (46.7)	634 (53.3)		
36	Age					Overall: .052
37	65+	530	198 (37.4)	332 (62.6)	1.04, 0.61 to 1.79	.880
38	55-64	245	111 (45.3)	134 (54.7)	0.76, 0.44 to 1.30	.309
39	45-54	235	115 (48.9)	120 (51.1)	0.83, 0.50 to 1.39	.484
40	35-44	245	135 (55.1)	110 (44.9)	0.59, 0.36 to 0.96	.035
41	25-34	265	152 (57.4)	113 (42.6)	0.56, 0.35 to 0.91	.018
42	vs. 16-24	226	92 (40.7)	134 (59.3)		
43	Gender					
44	Male	754	319 (42.3)	435 (57.7)	0.99, 0.73 to 1.33	.985
45	vs. Female	992	484 (48.8)	508 (51.2)		
46	Ethnicity					
47	White British	1,450	634 (43.7)	816 (56.3)	1.47, 1.07 to 2.02	.019
48	vs. Other groups	296	169 (57.1)	127 (42.9)		
49	Marital status					Overall: .870
50	Married/Living as a couple	964	440 (45.6)	524 (54.4)	1.07, 0.78 to 1.47	.685
51	Widowed/Divorced/Separated	341	151 (44.3)	190 (55.7)	1.00, 0.66 to 1.50	.990
52	vs. Single	441	212 (48.1)	229 (51.9)		
53	Highest level of education					Overall: .076
54	Graduate level/Above	494	233 (47.2)	261 (52.8)	1.20, 0.79 to 1.83	.386
55	A-levels/AS levels/Equivalent	438	199 (45.4)	239 (54.6)	1.12, 0.75 to 1.67	.582
56	GCSEs/Equivalent	429	224 (52.2)	205 (47.8)	0.86, 0.59 to 1.26	.447
57	Trade apprenticeships/Other	86	32 (37.2)	54 (62.8)	1.85, 1.01 to 3.39	.047
58	vs. No formal qualifications	299	115 (38.5)	184 (61.5)		

Social class grade						Overall: .990
1	Grade A or B	317	140 (44.2)	177 (55.8)	0.96, 0.65 to 1.41	.828
2	Grade C1	505	232 (45.9)	273 (54.1)	0.99, 0.72 to 1.37	.968
3	Grade C2	385	179 (46.5)	206 (53.5)	1.02, 0.73 to 1.43	.892
4	vs. Grade D or E	539	252 (46.8)	206 (53.5)		
Employment status						
6	Working	806	410 (50.9)	396 (49.1)	0.94, 0.71 to 1.25	.673
7	vs. Not working	940	393 (41.8)	547 (58.2)		
Area type						
9	Urban	1,420	656 (46.2)	764 (53.8)	0.96, 0.72 to 1.29	.795
10	vs. Rural	326	147 (45.1)	179 (54.9)		
Personal diagnosis of cancer						
12	Yes	1,599	737 (46.1)	862 (53.9)	1.00, 0.66 to 1.50	.994
13	vs. No	147	66 (44.9)	81 (55.1)		
Personal experience of breast screening						Overall: .062
16	Taken part	411	193 (47.0)	218 (53.0)	0.65, 0.43 to 0.97	.035
17	Invited, never taken part	48	20 (41.7)	28 (58.3)	1.10, 0.51 to 2.35	.813
18	vs. Not eligible or not invited	1,287	590 (45.8)	697 (54.2)		
Belief that screening is almost always a good idea						
20	Yes	1,609	715 (44.4)	894 (55.6)	1.96, 1.28 to 3.00	.002
21	vs. No or not sure	137	88 (64.2)	49 (35.8)		
Awareness of volcano news						
23	Yes	1,332	594 (44.6)	738 (55.4)	1.00, 0.74 to 1.35	.987
24	vs. No or not sure	414	209 (50.5)	205 (49.5)		
Awareness of election news						
26	Yes	1,114	491 (44.1)	623 (55.9)	1.03, 0.80 1.33	.817
27	vs. No or not sure	632	312 (49.4)	320 (50.6)		
General level of trust in participants' GPs						Overall: <.0005
30	A lot	965	224 (23.2)	741 (76.8)	11.98, 6.07 to 23.64	<.0005
31	Somewhat	513	370 (72.1)	143 (27.9)	1.39, 0.70 to 2.76	.350
32	A little	212	165 (77.8)	47 (22.2)	1.12, 0.54 to 2.33	.770
33	vs. Not at all	56	44 (78.6)	12 (21.4)		

Table F – Full results of the binary logistic regression model testing for an association between awareness of the breast screening media coverage and frequency of worry about breast cancer

Characteristic	Total (n=700)	Never; occasionally vs. Sometimes; often; very often: n (%) / M (SD)		Adjusted OR, 95% CI	p-value	
		Never; occasionally (n=441; 63.0%)	Sometimes; often; very often (n=259; 37.0%)			
Screening story awareness						
Overall: .198						
47	Aware of the main story and both follow-up commentaries	88	65 (73.9)	23 (26.1)	0.85, 0.46 to 1.58	.614
49	Aware of the main story and overdiagnosis follow-up	63	42 (66.7)	21 (33.3)	1.05, 0.55 to 2.01	.878
51	Aware of the main story and all-cause mortality follow-up	36	25 (69.4)	11 (30.6)	1.10, 0.49 to 2.49	.819
53	Aware of the main story only	270	153 (56.7)	117 (43.3)	1.49, 0.98 to 2.25	.062
54	vs. Unaware of the story	243	156 (64.2)	87 (35.8)		
Recruitment wave						
56	Wave 2: 20-26 th June	229	152 (66.4)	77 (33.6)	0.83, 0.58 to 1.19	.304
57	vs. Wave 1: 6-10 th June	471	289 (61.4)	182 (38.6)		
Ethnicity						
59	White British	563	354 (62.9)	209 (37.1)	0.90, 0.58 to 1.39	.635
60	vs. Other groups	137	87 (63.5)	50 (36.5)		
Marital status						
Overall: .272						

1	Married/Living as a couple	403	255 (63.3)	148 (36.7)	1.14, 0.76 to 1.72	.519
2	Widowed/Divorced/Separated vs. Single	100 197	58 (58.0) 128 (65.0)	42 (42.0) 69 (35.0)	1.61, 0.90 to 2.87	.110
3	Highest level of education					Overall: .026
4	Graduate level/Above	230	149 (64.8)	81 (35.2)	0.40, 0.21 to 0.79	.008
5	A-levels/AS levels/Equivalentents	206	138 (67.0)	68 (33.0)	0.67, 0.19 to 0.70	.002
6	GCSEs/Equivalentents	176	105 (59.7)	71 (40.3)	0.57, 0.31 to 1.04	.068
7	Trade apprenticeships/Other	17	12 (70.6)	5 (29.4)	0.33, 0.10 to 1.10	.072
8	vs. No formal qualifications	71	37 (52.1)	34 (47.9)		
9	Social class grade					Overall: .704
10	Grade A or B	125	84 (67.2)	41 (32.8)	1.07, 0.60 to 1.90	.819
11	Grade C1	209	123 (58.9)	86 (41.1)	1.31, 0.80 to 2.13	.282
12	Grade C2	165	105 (63.6)	60 (36.4)	1.11, 0.67 to 1.83	.691
13	vs. Grade D or E	201	129 (64.2)	72 (35.8)		
14	Employment status					
15	Working	392	239 (61.0)	153 (39.0)	1.15, 0.81 to 1.64	.435
16	vs. Not working	308	202 (65.6)	106 (34.4)		
17	Area type					
18	Urban	574	366 (63.8)	208 (36.2)	0.83, 0.54 to 1.26	.378
19	vs. Rural	126	75 (59.5)	51 (40.5)		
20	Personal diagnosis of cancer					
21	Yes	44	26 (59.1)	18 (40.9)	1.62, 0.82 to 3.22	.169
22	vs. No	656	415 (63.3)	241 (36.7)		
23	Personal experience of breast screening					Overall: .428
24	Taken part	221	151 (68.3)	70 (31.7)	0.66, 0.36 to 1.23	.193
25	Invited, never taken part	34	23 (67.6)	11 (32.4)	0.75, 0.30 to 1.89	.537
26	vs. Not eligible or not invited	445	267 (60.0)	178 (40.0)		
27	Belief that screening is almost always a good idea					
28	Yes	660	412 (62.4)	248 (37.6)	1.12, 0.50 to 2.51	.779
29	vs. No or not sure	40	29 (72.5)	11 (27.5)		
31	Awareness of volcano news					
32	Yes	505	323 (64.0)	182 (36.0)	0.91, 0.61 to 1.36	.645
33	vs. No or not sure	195	118 (60.5)	77 (39.5)		
34	Awareness of election news					
35	Yes	424	275 (64.9)	149 (35.1)	0.84, 0.59 to 1.20	.340
36	vs. No or not sure	276	166 (60.1)	110 (39.9)		
37	General level of trust in participants' GPs					Overall: .791
38	A lot	339	220 (64.9)	119 (35.1)	1.26, 0.50 to 3.15	.626
39	Somewhat	221	131 (59.3)	90 (40.7)	1.47, 0.58 to 3.72	.412
40	A little	109	69 (63.3)	40 (36.7)	1.25, 0.49 to 3.22	.641
41	vs. Not at all	31	21 (67.7)	10 (32.3)		
43	General level of trust in the NHS					Overall: .744
44	A lot	344	223 (64.8)	121 (35.2)	1.14, 0.41 to 3.21	.802
45	Somewhat	257	151 (58.8)	106 (41.2)	1.39, 0.49 to 3.91	.535
46	A little	76	51 (67.1)	25 (32.9)	1.13, 0.38 to 3.36	.833
47	vs. Not at all	23	16 (69.6)	7 (30.4)		
48	Breast screening intentions for next invitation					Overall: .163
49	Yes, definitely	601	369 (61.4)	232 (38.6)	1.48, 0.47 to 4.68	.503
50	Yes, probably	70	49 (70.0)	21 (30.0)	0.93, 0.27 to 3.25	.913
51	No, probably not	13	12 (92.3)	1 (7.7)	0.25, 0.02 to 2.70	.254
52	vs. No, definitely not	16	11 (68.8)	5 (31.3)		
53	Age (in years)	700	43.7 (15.5)	41.8 (14.3)	0.99, 0.97 to 1.01	.463

Table G – Full results of the binary logistic regression model testing for an association between awareness of the breast screening media coverage and breast screening intentions

		Yes, definitely vs. Yes, probably; no, probably not; no, definitely not: n (%)		Adjusted OR, 95% CI	p-value	
		Total	No definite intention	Definite intention	Definite intention	
		(n=700)	(n=99; 14.1%)	(n=601; 85.9%)	(vs. No definite intention)	
Screening story awareness					Overall: .108	
6	Aware of the main story and both follow-up commentaries	88	10 (11.4)	78 (88.6)	2.01, 0.74 to 5.48	.172
8	Aware of the main story and overdiagnosis follow-up	63	4 (4.3)	59 (93.7)	2.66, 0.79 to 8.89	.113
10	Aware of the main story and all-cause mortality follow-up	36	6 (16.7)	30 (83.3)	0.66, 0.20 to 2.13	.486
12	Aware of the main story only	270	22 (8.1)	248 (91.9)	1.88, 0.99 to 3.57	.054
14	vs. Unaware of the story	243	57 (23.5)	186 (76.5)		
Recruitment wave						
16	Wave 2: 20-26 th June	229	40 (17.5)	189 (82.5)	0.71, 0.42 to 1.21	.211
17	vs. Wave 1: 6-10 th June	471	59 (12.5)	412 (87.5)		
Age						Overall: .050
19	65+	69	7 (10.1)	62 (89.9)	0.84, 0.13 to 5.37	.855
20	55-64	123	5 (4.1)	118 (95.9)	2.49, 0.42 to 14.74	.313
21	45-54	128	10 (7.8)	118 (92.2)	3.59, 1.10 to 11.69	.034
22	35-44	143	21 (14.7)	122 (85.3)	2.72, 1.16 to 6.41	.022
23	25-34	144	29 (20.1)	115 (79.9)	2.82, 1.24 to 6.42	.014
24	vs. 16-24	93	27 (29.0)	66 (71.0)		
Ethnicity						
25	White British	563	72 (12.8)	491 (87.2)	0.96, 0.51 to 1.83	.905
26	vs. Other groups	137	27 (19.7)	110 (80.3)		
Marital status						Overall: .321
28	Married/Living as a couple	403	49 (12.2)	354 (87.8)	0.99, 0.53 to 1.84	.970
29	Widowed/Divorced/Separated	100	6 (6.0)	94 (94.0)	2.18, 0.73 to 6.53	.163
30	vs. Single	197	44 (22.3)	153 (77.7)		
Highest level of education						Overall: .169
32	Graduate level/Above	230	35 (15.2)	195 (84.8)	0.69, 0.22 to 2.20	.533
33	A-levels/AS levels/Equivalent	206	35 (17.0)	171 (83.0)	0.87, 0.29 to 2.62	.808
34	GCSEs/Equivalent	176	19 (10.8)	157 (89.2)	1.92, 0.62 to 5.92	.259
35	Trade apprenticeships/Other	17	3 (17.6)	14 (82.4)	1.38, 0.24 to 0.81	.720
36	vs. No formal qualifications	71	7 (9.9)	64 (90.1)		
Social class grade						Overall: .186
38	Grade A or B	125	14 (11.2)	111 (88.8)	1.87, 0.76 to 4.61	.177
39	Grade C1	209	25 (12.0)	184 (88.0)	2.36, 1.08 to 5.16	.032
40	Grade C2	165	24 (14.5)	141 (85.5)	1.85, 0.86 to 3.98	.118
41	vs. Grade D or E	201	36 (17.9)	165 (82.1)		
Employment status						
43	Working	392	56 (14.3)	336 (85.7)	0.70, 0.39 to 1.26	.238
44	vs. Not working	308	43 (14.0)	265 (86.0)		
Area type						
46	Urban	574	83 (14.5)	491 (85.5)	0.79, 0.39 to 1.59	.512
47	vs. Rural	126	16 (12.7)	110 (87.3)		
Personal diagnosis of cancer						
49	Yes	44	7 (15.9)	37 (84.1)	0.94, 0.30 to 2.98	.918
50	vs. No	656	92 (14.0)	564 (86.0)		
Personal experience of breast screening						Overall: .013
52	Taken part	221	9 (4.1)	212 (95.9)	6.12, 1.37 to 27.33	.018
53	Invited, never taken part	34	6 (17.6)	28 (82.4)	0.99, 0.21 to 4.61	.986
54	vs. Not eligible or not invited	445	84 (18.9)	361 (81.1)		
Belief that screening is almost always a good idea						
57	Yes	660	81 (12.3)	579 (87.7)	9.08, 3.77 to 21.88	<.0005
58	vs. No or not sure	40	18 (45.0)	22 (55.0)		
Awareness of volcano news						
60	Yes	505	54 (10.7)	451 (89.3)	1.34, 0.74 to 2.41	.335
	vs. No or not sure	195	45 (23.1)	150 (76.9)		

Awareness of election news						
1	Yes	424	47 (11.1)	377 (88.9)	1.42, 0.82 to 2.46	.208
2	vs. No or not sure	276	52 (18.8)	224 (81.2)		
General level of trust in participants' GPs						
					Overall: .025	
5	A lot	339	31 (9.1)	308 (90.9)	1.55, 0.45 to 5.29	.487
6	Somewhat	221	44 (19.9)	177 (80.1)	0.76, 0.23 to 5.67	.663
7	A little	109	16 (14.7)	93 (85.3)	2.48, 0.69 to 8.90	.163
8	vs. Not at all	31	8 (25.8)	23 (74.2)		
General level of trust in the NHS						
					Overall: .007	
10	A lot	344	34 (9.9)	310 (90.1)	1.16, 0.29 to 4.64	.832
11	Somewhat	257	42 (16.3)	215 (83.7)	0.70, 0.18 to 2.79	.614
12	A little	76	18 (23.7)	58 (76.3)	0.27, 0.06 to 1.11	.068
13	vs. Not at all	23	5 (21.7)	18 (78.3)		
Frequency of worry about breast cancer						
					Overall: .028	
15	Very often	39	3 (7.7)	36 (92.3)	3.00, 0.72 to 12.51	.132
16	Often	43	5 (9.3)	39 (90.7)	2.95, 0.85 to 10.26	.089
17	Sometimes	177	20 (11.3)	157 (88.7)	2.59, 1.31 to 5.15	.006
18	Occasionally	231	27 (11.7)	204 (88.3)	2.15, 1.15 to 4.02	.016
19	vs. Never	210	45 (21.4)	165 (78.6)		

Table H – Number of participants with missing data for each variable of interest

Measure	Total (n=1,894)
Awareness of the news about breast screening	0
Recruitment wave	0
Gender	0
Ethnicity	8
Marital status	0
Highest level of education	17
Social class grade	0
Employment status	0
Area type	0
Personal diagnosis of cancer	33
Personal experience of breast screening	33
Belief that screening is almost always a good idea	0
Awareness of the news about the volcanic eruption	0
Awareness of the news about the local elections	0
General level of trust in participants' GPs	67
General level of trust in the NHS	19
Frequency of worry about breast cancer	22
Breast screening intentions for next invitation	9

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60STROBE Statement—Checklist of items that should be included in reports of *cross-sectional studies*

	Item No	Recommendation	Page number
Title and abstract	1	(a) Indicate the study's design with a commonly used term in the title or the abstract	1
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	3-4
Objectives	3	State specific objectives, including any prespecified hypotheses	4
Methods			
Study design	4	Present key elements of study design early in the paper	4
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	4
Participants	6	(a) Give the eligibility criteria, and the sources and methods of selection of participants	4-5
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	5-7
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	5-7
Bias	9	Describe any efforts to address potential sources of bias	4-8
Study size	10	Explain how the study size was arrived at	5
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	7-8
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding	7-8
		(b) Describe any methods used to examine subgroups and interactions	7-8
		(c) Explain how missing data were addressed	8
		(d) If applicable, describe analytical methods taking account of sampling strategy	N/A
		(e) Describe any sensitivity analyses	N/A
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	8-13
		(b) Give reasons for non-participation at each stage	8
		(c) Consider use of a flow diagram	N/A
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	8-9
		(b) Indicate number of participants with missing data for each variable of interest	P8 (appendix 2)
Outcome data	15*	Report numbers of outcome events or summary measures	8-13
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	11-13

		(b) Report category boundaries when continuous variables were categorized	11-13
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	N/A
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	N/A
Discussion			
Key results	18	Summarise key results with reference to study objectives	8-10
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	15-16
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	16
Generalisability	21	Discuss the generalisability (external validity) of the study results	14-16
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	16

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at www.strobe-statement.org.

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Public awareness of and responses to media coverage of invitation errors in the Breast Screening Programme in England: A cross-sectional population survey

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6 **Title:** Public awareness of and responses to media coverage of invitation errors in the Breast
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16
17
18
19 **Authors:**

20
21 Alex Ghanouni^a a.ghanouni@ucl.ac.uk
22

23
24 Christian von Wagner^a c.wagner@ucl.ac.uk
25

26
27 Jo Waller^{ab} j.waller@ucl.ac.uk | Tel: +44 (0)20 7679 5958 | Fax: +44 (0)20 7679 8354
28
29

30
31
32 **Affiliations:**
33

34
35 ^aResearch Department of Behavioural Science and Health, University College London, Gower Street,
36 London, WC1E 6BT, United Kingdom
37
38

39
40 ^bCorresponding author
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ABSTRACT

Objectives: In May 2018, the British Health Secretary announced the 'serious failure' that 450,000 women had missed out on invitations to breast screening in England, leading to extensive media coverage. This study measured public awareness of the story and tested for associated factors (e.g. educational level and trust in the NHS).

Design: A computer-assisted face-to-face survey in June 2018.

Setting: Participants completed the survey in their homes.

Participants: Males and females aged 16 years or older in England.

Primary and secondary outcome measures: Awareness of aspects of the media coverage and reported statistics. Other data included demographics (e.g. ethnicity), awareness of unrelated contemporaneous news stories, trust in participants' GPs and the NHS, and (among women) worry about breast cancer and future breast screening intentions.

Results: Descriptive statistics showed that 67% of 1,894 participants reported being aware of the media coverage. Regression analyses showed that those who were aware of other news stories, were white British, and had a higher level of education or social class grade were more likely to be aware. In contrast, only 36% correctly identified at least one of two headline statistics. This study did not find evidence that awareness was negatively associated with trust in participants' GPs or the NHS, breast cancer worry or future breast cancer screening intentions.

Conclusions: Awareness of the breast screening news story was high but recall of reported statistics was much lower: the public may have retained only the gist of quantitative information. Associations between story awareness and attitudes or behaviour were not apparent.

Keywords: Breast imaging; Journalism; Organisation of health services; Public Health

Strengths and limitations of this study:

- This study builds on previous research on media coverage around public health concerns by measuring levels of awareness among the general public and testing for characteristics associated with awareness.
- The survey was carried out shortly after media coverage of the announcement began, when awareness and knowledge were likely to be at their highest.
- Associations between awareness of media coverage and e.g. greater worry about breast cancer and lower trust in the NHS were not apparent but Type II error cannot be excluded.
- Tests for associations between awareness of media coverage and screening behaviour were based on intended future uptake; actual uptake may differ.

INTRODUCTION

On 2nd May 2018, the Health Secretary in Great Britain, Jeremy Hunt, made an unanticipated statement to the House of Commons regarding *"a serious failure...in the national Breast Screening Programme"*. Mr Hunt stated that since 2009, *"a computer algorithm failure"* had resulted in approximately 450,000 women not being invited to their final regular breast screening appointment (i.e. when they were aged 68 to 71 years). He indicated to the House that *"[the] current best estimate based on statistical modelling...is that there may be between 135 and 270 women who had their lives shortened as a result"* and that women affected *"will automatically be sent an invitation to a catch-up screening"*.¹ News of this statement was reported extensively in the national media (e.g. ²⁻⁴) and prompted a volume of follow-up commentary from academics aiming to add context to this story. For example, some raised arguments that breast screening has no effect on all-cause mortality and risks resulting in overdiagnosis.⁵⁻⁶

Awareness of health-related media coverage is likely to be very high among academics and clinicians who are professionally invested in the topic. However, research is lacking on the prevalence of awareness of this type of news among the general public. In the absence of empirical data, it might be hypothesised to be either high (e.g. because mainstream media coverage has an extremely wide reach) or generally low (because members of the public are more focused on their personal priorities or do not have a specific interest in health news).

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3 Levels of public awareness of health media coverage is significant because it represents the
4 proportion of people who may be influenced by it: previous research has found that media coverage
5 of cancer-related stories in the United Kingdom has appreciable public health implications. For
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7 example, there is evidence that the cervical cancer diagnosis and death of a young female celebrity,
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9 Jade Goody, influenced women's cervical cancer screening decisions and temporarily increased
10
11 uptake and diagnoses of high-grade cervical neoplasia.⁷⁻¹⁰ Similarly, uptake of the colorectal
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13 screening programme increased following coverage of the United Kingdom Flexible Sigmoidoscopy
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15 Screening Trial.¹¹⁻¹² This coverage often contained elements likely to be perceived highly favourably
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17 by the general public such as the fact that it was a five-minute, one-off test that could save thousands
18
19 of lives. In addition, the word "breakthrough" was often featured.¹³⁻¹⁶ Comparable findings have been
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21 reported by studies of pre-planned media messages such as Public Health England's 'Be Clear on
22
23 Cancer' campaigns, which aim to increase cancer symptom awareness. These were associated with
24
25 an increase in symptomatic attendance at General Practices and referrals to secondary care.¹⁷⁻¹⁹
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29 In these cases, media coverage was associated with an increase in healthcare usage. However,
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31 news about an error in the screening programme may have had adverse effects, such as diminishing
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33 trust in the National Health Service (with corresponding negative implications for help-seeking), more
34
35 frequent worry about breast cancer, and being less inclined to have breast screening in future. To our
36
37 knowledge, this possibility has not been investigated by research to date.
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40 This study surveyed awareness of the coverage shortly after the announcement (when conscious
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42 recall was likely to be highest) in a large, sociodemographically diverse sample of the general public.
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44 In order to make a more complete assessment of this awareness, we also measured knowledge of
45
46 the relevant statistics most commonly reported as part of the story (i.e. the number of women
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48 estimated to have missed an invitation and to have had their lives shortened) since these were a key
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50 factor in making a personal assessment of the scale and severity of the invitation errors. We also
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52 recognised that people's concerns about the initial coverage may have been moderated by follow-up
53
54 commentary noting issues around overdiagnosis and all-cause mortality in breast screening. We used
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56 these measures to conduct an exploratory analysis of variables associated with awareness of the
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58 media coverage, including education, gender, and awareness of other news stories that were
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60 reported around the same time. We also tested the hypotheses that awareness of the breast

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3 screening media coverage would be associated with lower trust in participants' GPs and the NHS and
4 (in women) more frequent worry about breast cancer and being less likely to intend to participate in
5 breast screening in future.
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10 **METHODS**

11 **Design**

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15 Institutional ethical approval was obtained (registration number: 2951/006). A market research agency
16 (Kantar TNS UK) collected data in two waves of sampling between 6th and 10th June 2018 (i.e. less
17 than six weeks after the initial news story. The survey questions formed one module within a weekly
18 face-to-face computer-assisted omnibus survey on a wider range of topics. Random location sampling
19 was used to identify target households based on the 2011 Census and Postcode Address File. At
20 each location, quotas were set with the aim of achieving national representativeness based on
21 working status, children in the household, gender, and age.
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29 The full survey is included in Appendix 1. Participants were initially shown a computer screen with text
30 introducing the study and asking for their consent to participate. They were also given an information
31 card containing debrief text and directions to further information about breast screening.
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36 **Participants**

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39 Eligible participants were all males and females in England aged 16 years or older who consented to
40 take part in this module of the survey. The sample includes women eligible for breast screening (i.e.
41 aged 47 to 73 years) and also members of the general population (males and females aged 16 years
42 or older) since it was hypothesised that awareness of the story had the potential to negatively affect
43 perceptions of other health services, irrespective of whether participants were affected directly.
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48 Sample size was based on budgetary constraints and the number of participants who could be
49 approached no more than six weeks after the initial news story.
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53 **Patient and public involvement**

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56 Since the results of the study were expected to be highly time-sensitive, rapid data collection was
57 prioritised over involving patients and the public in the design and conduct of the study. In order to
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3 minimise data protection issues, survey responses were received by the research team in
4 anonymised format, meaning that it is not possible to disseminate study results to participants.
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7 **Measures**

8 **Demographics:**

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13 General background information included participants' self-reported age (in years), gender, ethnic
14 origin, marital status, education, social class grade,²⁰ employment status, and urban or rural area
15 type.
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18 **Cancer and breast screening experience, and attitudes towards screening:**

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23 Participants were asked whether they had been diagnosed with any of several types of cancer
24 themselves. Women aged 47 years or older were also asked if they had ever been i) invited to and ii)
25 participated in the Breast Screening Programme.
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33 Participants were asked about their attitudes towards screening via a previously used question,²¹
34 *"routine screening means testing healthy people to find cancer before they have any symptoms. Do*
35 *you think routine cancer screening tests for healthy people are almost always a good idea?"*.

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Response options were "yes", "no", and "not sure".

Awareness of the breast screening news story:

Participants were asked to read a brief summary of the story (see Appendix 1, Q7), the main details of
which were derived from the primary story on the topic on the BBC news website.⁴ This was followed
by the question, *"do you recall seeing or hearing anything about this news story before now?"*.

Response options were "yes", "no", and "not sure".

It was anticipated that directions of associations with awareness may depend on the specific parts of
the story of which participants were aware. Consequently, participants who reported being aware of
the main news story were also asked about their awareness of issues relating to all-cause mortality
and overdiagnosis using two further summaries (see Appendix 1, Q14 and Q15), derived from two
sources.⁵⁻⁶

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3 Questions for assessing awareness were the same as previous. Participants reporting awareness of
4 the news story were also asked where they saw or heard it and whether they discussed or shared it
5 with anyone else. They were also asked two questions on the key statistics reported based on the
6 following summaries:
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11 *“The Health Secretary, Jeremy Hunt, gave an estimate of the number of women who had failed to get*
12 *invitations since 2009.”*
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16 *“The Health Secretary also gave an estimate, based on computer modelling, of the number of women*
17 *who may have had their lives shortened.”*
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21 For both, the question was *“which of the following do you think is the estimate that he gave?”*. For the
22 first question, response options consisted of the true estimate (450,000) and three alternatives that
23 were orders of magnitude higher or lower (4,500, 45,000, and 4,500,000). Similarly, response options
24 for the second question consisted of the correct answer (between 135 and 270) and alternatives that
25 were either an order of magnitude higher (1,350 and 2,700), lower (13 and 27), or both higher and
26 lower (13 and 2,700). Response order was presented in one of two different ways for each participant
27 (determined at random) to reduce potential order effects.
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35 Awareness of news stories unrelated to breast screening:
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38 Awareness of other news stories was measured by asking participants to read two further summaries
39 (one on a volcano eruption in Hawaii; one on local council elections in England; see Appendix 1, Q19
40 and Q20). This was followed by the same measure of awareness as in previous questions. Main
41 details were derived from the primary stories on the BBC news website.²²⁻²³ These two stories were
42 selected for comparison because they were reported around the same time and also consisted of
43 specific, definable events.
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50 Trust in health services:
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53 Participants were asked two questions based on previously used items,²⁴⁻²⁵ *“in general, how much do*
54 *you trust...”* i) *“...your general practitioner?”* and ii) *“...the NHS?”*. Response options for both were
55 *“not at all”, “a little”, “somewhat”, “a lot”, and “not sure”*.
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59 Frequency of breast cancer worry:
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3 Breast cancer worry (among women) was measured using an item based on one previously used,²⁶
4 “how often do you worry about your chances of getting breast cancer yourself?”. Response options
5 were, “never”, “occasionally”, “sometimes”, “often”, “very often”, “not sure”, and “prefer not to say”.
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10 Breast screening intentions:

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12 Women aged 16 to 69 years were asked, “do you think you will go for breast screening when you are
13 next offered it?”. Response options were “yes, definitely”, “yes, probably”, “no, probably not”, and “no,
14 definitely not”.
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18 19 **Analysis**

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21 Participant characteristics and awareness about the news stories are reported using descriptive
22 statistics. Responses of “prefer not to say” were excluded, as were responses of “not sure” for ordinal
23 variables. Other responses of “not sure”, were grouped with “no”. Ethnicity was dichotomised into
24 “white British” and “other groups”; social class grades were grouped into “A or B”, “C1”, “C2”, and “D
25 or E”. For education, “trade apprenticeships” were grouped with “other qualifications”. Responses to
26 measures of invitations to and participation in breast screening were coded into “not eligible or not
27 invited”, “invited, never taken part”, and “taken part”.
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36 One exploratory regression model tested for variables potentially associated with whether people
37 responded to the survey. Three exploratory regression models tested for variables potentially
38 associated with i) awareness of the breast screening news; and stating correctly the number of
39 women who were ii) not invited for screening and iii) estimated to have had their lives shortened. A
40 further four regression models tested the null hypotheses that awareness of the breast screening
41 news story was not associated with trust in iv) participants’ GPs and v) the NHS in the whole sample;
42 and vi) frequency of worry about breast cancer and vii) intentions to participate in breast screening in
43 future among women aged 70 years or less, after adjusting for covariates.
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52 For the model assessing variables associated with responding to the questionnaire, the main
53 variables of interest were recruitment wave, gender, ethnicity, marital status, social class grade,
54 employment status, area type, and age (since these were the variables where data were available for
55 both participants and non-participants). For the four main exploratory models and hypothesis testing
56 models, independent variables were as above with the addition of other available measures (listed in
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3 tables) where multi-collinearity was not an appreciable issue (i.e. Variance Inflation Factors <10). Age
4 was included in models as either a continuous variable or divided into age groups (where a Box-
5 Tidwell procedure found evidence that the assumption of linearity was not met; $p < .05$). Frequency of
6 worry about breast cancer was also included in the model of future breast screening intentions.
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11 For models testing hypotheses, responses on measures of awareness of the breast screening story
12 were coded into a single nominal variable with five levels: 1) *“unaware of the story”*, 2) *“aware of the*
13 *main story only”*, 3) *“aware of the main story and all-cause mortality follow-up commentary”*, 4) *“aware*
14 *of the main story and overdiagnosis follow-up commentary”*, 5) *“aware of the main story and both*
15 *follow-up commentaries”*.
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22 Ordinal logistic regression was attempted in the first instance where dependent variables were
23 ordinal. Tests of parallel lines suggested that the assumption of proportional odds was generally not
24 met ($p < .0005$) and there were few cases in some cells. Hence, dependent variables were
25 dichotomised and binary logistic regression was used. Participants with missing data on variables of
26 interest were not included in models.
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32 **RESULTS**

33 **Participant characteristics**

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38 2,681 participants began the survey module. 787 (29.4%) opted out, leaving 1,894 participants who
39 provided data. Mean age was 50.8 years (standard deviation: 20.5). Characteristics are described in
40 Appendix 2 (Table A). Response to the survey module questions was associated with all variables in
41 the model, except for area type (Appendix 2, Table B). Participants of the omnibus survey
42 approached were more likely to respond to this survey module if they were invited in wave 1 (vs. wave
43 2), female (vs. male), white British (vs. other groups), married, living as a couple, or widowed,
44 divorced or separated (vs. single), in higher social class grades (vs. grades D or E), working (vs. not
45 working), and younger.
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54 **Awareness of news stories, sources of information, and variables associated with awareness** 55 **of the breast screening media coverage** 56 57 58 59 60

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3 1,264/1,894 (66.7%) reported being aware of the main news story (Appendix 2, Table A) and
4 relatively few reported being aware of follow-up commentaries: 438/1,264 (34.7%) and 367/1,264
5 (29.0%) recognised the commentaries on all-cause mortality and overdiagnosis, respectively.
6
7 250/1,264 (19.8%) were aware of both. 971/1,264 (76.8%) and 271/1,264 (21.4%) encountered the
8 story on television and radio, respectively (participants could select more than one). 169/1,264
9 (13.4%) and 134/1,264 (10.6%) encountered the story in print newspapers and online news websites
10 (Appendix 2, Table C). Other news sources were used relatively rarely e.g. 68/1,264 (5.4%) heard the
11 story from social media websites. 450/1,264 (35.6%) reported discussing or sharing the story with
12 someone else.
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21 Participants were more likely to be aware of the story if they were aware of either of the other two
22 news stories. Awareness of the three stories was highly interrelated: 824/1,894 participants (43.5%)
23 were aware of all three news stories and a further 196/1,894 (10.3%) reported not being aware of any.
24 Only 323/1,894 (17.1%) were aware of just one of the three stories and only 106/1,894 participants
25 (5.6%) were aware of the news about breast screening, specifically. Participants were also more likely
26 to be aware of the breast screening news story if they were white British, older, had higher levels of
27 education or social class grade. Participants were less likely to be aware if they believed that
28 screening was almost always a good idea. All other p-values were $\geq .207$ (Table 1).
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37 **Awareness of statistics from the breast screening media coverage and variables associated** 38 **with awareness among participants who reported being aware of the story** 39

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42 Only 233 (18.4%) of the 1,264 participants who reported being aware of the story correctly recognised
43 the number of women who had not been invited and only 268 (21.2%) correctly recognised the
44 estimated number of women who had their lives shortened. 809 (64.0%) did not correctly identify
45 either statistic and only 3.6% correctly identified both (Table 2). The model testing for demographic
46 and psychological variables associated with correctly identifying either set of statistics found only
47 weak evidence against the null hypothesis for all characteristics (p-values were $\geq .087$ and $\geq .062$ in the
48 respective models; data not shown).
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55 **Awareness of media coverage and participants' trust their GPs and the NHS** 56 57 58 59 60

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3 In both these models, there was only weak evidence against the null hypothesis. Table 3 shows the
4 main results of binary logistic regression models consisting of 1,746 participants ($p=.729$ and $.290$).
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6 Full results of the model are presented in Appendix 2 (Table D and Table E).
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10 **Awareness of media coverage and frequency of worry about breast cancer**

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12 Table 4 shows that there was only weak evidence against the null hypothesis ($n=700$; $p=.198$). Full
13 results are included in Appendix 2 (Table F).
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17 **Awareness of media coverage and future breast screening intentions**

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19 Table 5 shows that there was only weak evidence against the null hypothesis for this analysis ($n=700$;
20 $p=.108$). Full results are included in Appendix 2 (Table G).
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24 Numbers of participants with missing data for each variable are shown in Appendix 2 (Table H).
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Table 1 – Full results of the binary logistic regression model testing for variables associated with awareness of the breast screening news story

		Aware vs. Not aware of the breast screening story (or not sure): n (%)		Adjusted OR, 95% CI	p-value
Characteristic	Total (n=1,792)	Not aware/sure (n=587; 32.8%)	Aware (n=1,205; 67.2%)	Aware of the screening story (vs. Not aware or not sure)	
Recruitment wave					
Wave 2: 20-26 th June	570	185 (32.5)	385 (67.5)	1.02, 0.79 to 1.31	.907
vs. Wave 1: 6-10 th June	1,222	402 (32.9)	820 (67.1)		
Age					Overall: <.0005
65+	549	111 (20.2)	438 (79.8)	7.77, 4.52 to 13.38	<.0005
55-64	252	53 (21.0)	199 (79.0)	6.75, 3.92 to 11.63	<.0005
45-54	241	47 (19.5)	194 (80.5)	7.70, 4.56 to 13.00	<.0005
35-44	248	88 (35.5)	160 (64.5)	3.60, 2.22 to 5.84	<.0005
25-34	275	142 (51.6)	133 (48.4)	2.00, 1.27 to 3.14	.003
vs. 16-24	227	146 (64.3)	81 (35.7)		
Gender					
Male	771	234 (30.4)	537 (69.6)	1.00, 0.74 to 1.35	.999
vs. Female	1,021	353 (34.6)	668 (65.4)		
Ethnicity					
White British	1,491	415 (27.8)	1,076 (72.2)	3.00, 2.20 to 4.09	<.0005
vs. Other groups	301	172 (57.1)	129 (42.9)		
Marital status					Overall: .914
Married/Living as a couple	985	279 (28.3)	706 (71.7)	1.07, 0.78 to 1.47	.672
Widowed/Divorced/Separated	354	84 (23.7)	270 (76.3)	1.06, 0.70 to 1.60	.792
vs. Single	453	224 (49.4)	229 (50.6)		
Highest level of education					Overall: .001
Graduate level/Above	501	131 (26.1)	370 (73.9)	2.08, 1.34 to 3.23	.001
A-levels/AS levels/Equivalent	448	162 (36.2)	286 (63.8)	1.80, 1.19 to 2.73	.006
GCSEs/Equivalent	440	156 (35.5)	284 (64.5)	1.36, 0.92 to 2.00	.120
Trade apprenticeships/Other	89	39 (43.8)	50 (56.2)	0.75, 0.42 to 1.32	.316
vs. No formal qualifications	314	99 (31.5)	215 (68.5)		
Social class grade					Overall: <.0005
Grade A or B	326	53 (16.3)	273 (83.7)	2.44, 1.59 to 3.73	<.0005
Grade C1	511	165 (32.3)	346 (67.7)	1.41, 1.02 to 1.95	.037
Grade C2	394	142 (36.0)	252 (64.0)	1.13, 0.81 to 1.58	.469
vs. Grade D or E	561	227 (40.5)	334 (59.5)		
Employment status					
Working	823	287 (34.9)	536 (65.1)	0.91, 0.68 to 1.22	.909
vs. Not working	969	300 (31.0)	669 (69.0)		
Area type					
Urban	1,458	476 (32.6)	982 (67.4)	1.21, 0.90 to 1.64	.207
vs. Rural	334	111 (33.2)	223 (66.8)		
Personal diagnosis of cancer					
Yes	150	34 (22.7)	116 (77.3)	1.18, 0.74 to 1.86	.490
vs. No	1,642	553 (33.7)	1,089 (66.3)		
Personal experience of breast screening					Overall: .552
Taken part	425	90 (21.2)	335 (78.8)	0.92, 0.60 to 1.41	.705
Invited, never taken part	55	13 (23.6)	42 (76.4)	0.66, 0.32 to 1.39	.276
vs. Not eligible or not invited	1,312	484 (36.9)	828 (63.1)		
Belief that screening is almost always a good idea					
Yes	1,649	547 (33.2)	1,102 (66.8)	0.59, 0.38 to 0.94	.025
vs. No or not sure	143	40 (28.0)	103 (72.0)		
Awareness of volcano news					
Yes	1,367	325 (23.8)	1,042 (76.2)	3.14, 2.39 to 4.12	<.0005
vs. No or not sure	425	262 (61.6)	163 (38.4)		
Awareness of election news					
Yes	1,138	292 (25.7)	846 (74.3)	1.37, 1.06 to 1.75	.014
vs. No or not sure	654	295 (45.1)	359 (54.9)		
General level of trust in the NHS					Overall: .485
A lot	969	308 (31.8)	661 (68.2)	0.59, 0.29 to 1.18	.132

1	Somewhat	599	193 (32.2)	406 (67.8)	0.63, 0.31 to 1.27	.196
2	A little	169	69 (40.8)	100 (59.2)	0.58, 0.27 to 1.25	.166
3	vs. Not at all	55	17 (30.9)	38 (69.1)		

Table 2 – Descriptive statistics of participants' responses about key statistics in the breast screening media coverage; correct responses were "450,000" and "135-270"

n (% of total; 95% CI) (n=1,264)

10	Number of women who did not receive their final invitation...	Number of women who may have had their life shortened. Between...					
11		135 - 270	13 - 27	13 - 2,700	1,350 - 2,700	Not sure	Total
12	450,000	46 (3.6)	6 (0.5)	79 (6.3)	71 (5.6)	31 (2.5)	233 (18.4)
13	4,500	68 (5.4)	20 (1.6)	28 (2.2)	22 (1.7)	30 (2.4)	168 (13.3)
14	45,000	130 (10.3)	22 (1.7)	76 (6.0)	86 (6.8)	54 (4.3)	368 (29.1)
15	4,500,000	3 (0.2)	1 (0.1)	10 (0.8)	20 (1.6)	4 (0.3)	38 (3.0)
16	Not sure	21 (2.1)	5 (0.4)	15 (1.2)	12 (0.9)	404 (32.0)	457 (36.2)
17	Total	268 (21.2)	54 (4.3)	208 (16.5)	211 (16.7)	523 (41.4)	

Table 3 – Testing for an association between awareness of the breast screening media coverage and trust in i) participants' GPs and ii) the NHS*

27	General level of trust in participants' GPs	A lot vs. Not at all; a little; somewhat: n (%)		Adjusted OR, 95% CI	p-value	
28		Less than a lot	A lot	A lot		
29	Total (n=1,746)	(n=781; 44.7%)	(n=965; 55.3%)	(vs. Less than a lot)		
30	Screening story awareness				Overall: .729	
31	Aware of the main story and both follow-up commentaries	238	98 (41.2)	140 (58.8)	1.10, 0.74 to 1.64	.653
32	Aware of the main story and overdiagnosis follow-up	172	66 (38.4)	106 (61.6)	1.31, 0.85 to 2.03	.218
33	Aware of the main story and all-cause mortality follow-up	107	49 (45.8)	58 (54.2)	1.21, 0.73 to 2.02	.459
34	Aware of the main story only	655	280 (42.7)	375 (57.3)	1.17, 0.88 to 1.57	.283
35	vs. Unaware of the story	574	288 (50.2)	286 (49.8)		
42	General level of trust in the NHS	A lot vs. Not at all; a little; somewhat: n (%)		Adjusted OR, 95% CI	p-value	
43		Less than a lot	A lot	A lot		
44	Total (n=1,746)	(n=803; 46.0%)	(n=943; 54.0%)	(vs. Less than a lot)		
45	Screening story awareness				Overall: .290	
46	Aware of the main story and both follow-up commentaries	238	102 (42.9)	136 (57.1)	0.87, 0.59 to 1.30	.503
47	Aware of the main story and overdiagnosis follow-up	172	76 (44.2)	96 (55.8)	0.78, 0.51 to 1.21	.267
48	Aware of the main story and all-cause mortality follow-up	107	57 (53.3)	50 (46.7)	0.58, 0.35 to 0.97	.039
49	Aware of the main story only	655	299 (45.6)	356 (54.4)	0.81, 0.60 to 1.09	.160
50	vs. Unaware of the story	574	269 (46.9)	305 (53.1)		

*Results are adjusted based on the following covariates: Recruitment wave, Age (Age group in the model of trust in the NHS), Gender, Ethnicity, Marital status, Highest level of education, Social class grade, Employment status, Area type, Personal diagnosis of cancer, Personal experience of breast screening, Belief that screening is almost always a good idea, Awareness of volcano news, Awareness of election news, General level of trust in the NHS (General level of trust in participants' GPs in the model of trust in the NHS). Full results of the model are reported in the Appendix

Table 4 – Testing for an association between awareness of the breast screening media coverage and frequency of worry about breast cancer*

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Characteristic	Total (n=700)	Never; occasionally vs. Sometimes; often; very often: n (%)		Adjusted OR, 95% CI	p-value
		Never; occasionally (n=441; 63.0%)	Sometimes; often; very often (n=259; 37.0%)	Sometimes; often; very often (vs. Never; occasionally)	
Screening story awareness				Overall: .198	
Aware of the main story and both follow-up commentaries	88	65 (73.9)	23 (26.1)	0.85, 0.46 to 1.58	.614
Aware of the main story and overdiagnosis follow-up	63	42 (66.7)	21 (33.3)	1.05, 0.55 to 2.01	.878
Aware of the main story and all-cause mortality follow-up	36	25 (69.4)	11 (30.6)	1.10, 0.49 to 2.49	.819
Aware of the main story only	270	153 (56.7)	117 (43.3)	1.49, 0.98 to 2.25	.062
vs. Unaware of the story	243	156 (64.2)	87 (35.8)		

*Results are adjusted for covariates: Recruitment wave, Age, Ethnicity, Marital status, Highest level of education, Social class grade, Employment status, Area type, Personal diagnosis of cancer, Personal experience of breast screening, Belief that screening is almost always a good idea, Awareness of volcano news, Awareness of election news, General level of trust in participants' GPs, General level of trust in the NHS, Breast screening intentions for next invitation. Full results of the model are reported in the Appendix

Table 5 – Testing for an association between awareness of the breast screening media coverage and breast screening intentions*

Characteristic	Total (n=700)	Yes, definitely vs. Yes, probably; no, probably not; no, definitely not: n (%)		Adjusted OR, 95% CI	p-value
		No definite intention (n=99; 14.1%)	Definite intention (n=601; 85.9%)	Definite intention (vs. No definite intention)	
Screening story awareness				Overall: .108	
Aware of the main story and both follow-up commentaries	88	10 (11.4)	78 (88.6)	2.01, 0.74 to 5.48	.172
Aware of the main story and overdiagnosis follow-up	63	4 (4.3)	59 (93.7)	2.66, 0.79 to 8.89	.113
Aware of the main story and all-cause mortality follow-up	36	6 (16.7)	30 (83.3)	0.66, 0.20 to 2.13	.486
Aware of the main story only	270	22 (8.1)	248 (91.9)	1.88, 0.99 to 3.57	.054
vs. Unaware of the story	243	57 (23.5)	186 (76.5)		

*Results are adjusted for covariates: Recruitment wave, Age group, Ethnicity, Marital status, Highest level of education, Social class grade, Employment status, Area type, Personal diagnosis of cancer, Personal experience of breast screening, Belief that screening is always a good idea, Awareness of volcano news, Awareness of election news, General level of trust in participants' GPs, General level of trust in the NHS, Frequency of worry about breast cancer. Full results of the model are reported in the Appendix

DISCUSSION

Previous studies have found evidence that media messages can increase usage of a range of healthcare services (e.g. ^{7-10, 12, 17-19}). Awareness of this story about errors in the breast screening programme was hypothesised to have the potential for a range of negative effects. However, the results of this study did not provide strong evidence against the null hypothesis for any associations tested. To the extent that these results reflect an absence of harms, this is reassuring: we did not find evidence that awareness of the story reduced trust in the NHS or participants' GPs, increased frequency of worry about breast cancer, or negatively affected future breast screening intentions. If this is the case, it may be partly attributable to the news story saying little to reduce the perceived benefits of breast screening itself, in contrast to media coverage of e.g. the independent review of breast cancer screening, which reported on the issue of overdiagnosis extensively.²⁷⁻²⁸ Relatedly, the present study found that awareness was notably lower for follow-up commentaries on the shortcomings of breast screening, compared with the main story. In addition, the framing of the story may have been expected to reinforce the perceived benefits of screening by indicating that missing screening had negative consequences in terms of additional breast cancer deaths.

Population awareness of the breast screening news story was generally high. Television and radio were the main sources of information, broadly consistent with patterns of how most news is accessed, although the internet was used less often than observed in previous surveys.²⁹ Although no associations were found here, this finding is useful since it provides an estimate of the proportion of people who may be influenced by media coverage that does have positive or negative effects on health behaviour.^{7-10, 12, 17-19} In the absence of this study, a plausible

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9 rationale could have been found for why this estimate would be higher or lower than was shown
10 to be the case.

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13 Awareness of this story was related to awareness of other news stories, suggesting that an
14 appreciable proportion of the population can be broadly dichotomised into those who are
15 generally “news aware” and “news unaware”. These results do not suggest that a notable
16 proportion of the public are aware of health news, specifically. In contrast to these findings,
17 recall of the main statistics was markedly low and correct responses may be largely attributable
18 to random guessing.¹ In some respects, this is surprising since the statistics were an integral
19 part of the story and often part of headlines (e.g. ^{2-4, 30}) and may be a cause for concern: the
20 number of women affected and estimated to have died as a result are important pieces of
21 information in order for an individual to make a personal assessment of the scale and severity of
22 the news. This finding may suggest that people either tend not to attend to or memorise this
23 statistical information (meaning that they would not be able to factor it into their appraisal of the
24 significance of the story) or they retain only the ‘gist’ of the statistics involved.³¹ Awareness of
25 the breast screening story was greater among those with higher levels of education and social
26 class grade, those who were white British, and those who were older. Awareness of the breast
27 screening news story was also lower among participants with positive attitudes towards
28 screening (who may have been less likely to attend to a negative story).
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50 ¹ Participants were asked additional questions on the extent to which they trusted the statistics
51 and their reasons for not trusting them (if applicable). However, since responses were highly
52 suggestive of random guessing, no further analyses of these measures were attempted.
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9 This study has limitations. Despite the large sample size and adjustment for a range of
10 potentially confounding variables, the number of cases was relatively small in some cells (e.g.
11 for having been invited to, but never participated in, screening and not believing, or being
12 unsure whether, screening was almost always a good idea; Table 1) and some odds ratios were
13 estimated with wide confidence intervals. Real associations may not have been detected (Type
14 II error). In addition, our measures did not include a question on trust in the Breast Screening
15 Programme, specifically, meaning that we could not test for associations with this outcome.
16 Findings on screening uptake also relate only to anticipated future behaviour; future research
17 could build on this study by assessing whether the announcement was followed by a decrease
18 (or increase) in actual screening uptake. Although the response rate to this survey was higher
19 than others of its type (e.g. 71% in the present study vs. 42% reported by Low et al.),³²
20 members of the public were also less likely to participate in the survey module based on a
21 range of characteristics for which data were available. Results may be biased, insofar as
22 responses differed based on these variables or unmeasured participant characteristics that may
23 have reduced population-representativeness of the sample.
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37 38 **Conclusions**

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41 This study found that news of errors in the Breast Screening Programme in England had
42 reached a large proportion of the general public and that those aware of the media coverage
43 tended to be those aware of news stories in general. The proportion of people aware was also
44 higher among those who had more education, were in a higher social class grade, or were
45 older. In contrast, awareness of key statistics from the story was very low among participants
46 aware of the story, even less than six weeks after the onset of the main media coverage. The
47 results of this study did not provide evidence that media coverage had any effects on trust in
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9 aspects of the health service among the general public, or worry about breast cancer or breast
10 screening intentions among women. Future research should investigate possible effects of
11 media coverage using objective measures of screening behaviour.
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17 manuscript, participated in critical revision, and approved the final version. Patients and the
18 public were not involved in this study.
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52 **Competing interests:** None declared.
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9 **Patient consent:** Obtained.

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11 **Data sharing:** No additional data are available.

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APPENDIX 1 - SURVEY

[All Adults 16+ in England. Participants were shown the tablet screen and the following text was read out by interviewers]

Q.A In this part of the survey, I am going to ask you some questions related to health, including cancer, and recent news stories. These questions are asked on behalf of researchers from University College London. If you do not wish to answer a particular question during any part of this survey, you may refuse to answer and we will move to the next question. All your answers will be kept strictly confidential and you will be anonymous to the researchers.

The NHS currently offers breast cancer screening with mammography once every three years, to women aged between about 50 to 70 years in England.

Are you okay to continue with these questions?

1: Yes

2: No

As the questions can be perceived as sensitive, you can answer the questions on this machine yourself. I would now like to show you how to use the machine by going through a practice question with you.

[All Adults 16+ in England willing to continue. "Don't know"/"Not sure"/"Prefer not to say" appeared at the top of the screen, out of view of participants, except for questions that participants completed themselves. Interviewers showed the screen to participants]

This is an example of a single-coded question

Q.B What is your favourite colour?

1: Red

2: Yellow

1
2
3 3: Blue
4

5
6 4: Green
7

8 Other colour (PEN -WRITE IN)
9

10
11 Don't know
12

13
14 Refused
15

16
17
18
19 [All females aged 16-69 in England willing to continue. Interviewers handed tablets to participants and
20 stepped away from viewing the screen]
21

22
23
24 Q.1 Do you think you will go for breast screening when you are next offered it? REMEMBER TO TAP
25

26 OK TO CONTINUE
27

28
29 1: Yes, definitely
30

31 2: Yes, probably
32

33 3: No, probably not
34

35 4: No, definitely not
36

37 Not sure
38

39 Prefer not to say
40
41
42
43
44
45
46
47

48 [All females aged 47+ in England willing to continue]
49

50
51 Q.2 Have you ever been invited for breast screening before? If you've only ever been offered a
52 mammogram to investigate symptoms separately to the screening programme, please respond 'no'.
53

54
55 1: Yes
56

57
58 2: No
59
60

1
2
3 Not sure

4
5
6 Prefer not to say

7
8
9
10
11 [All females aged 47+ in England who have been invited for breast screening before]

12
13
14 Q.3 Have you ever been for breast screening as part of the screening programme?

15
16
17 1: Yes

18
19
20 2: No

21
22
23 Not sure

24
25
26 Prefer not to say

27
28
29
30
31 [All Adults 16+ in England willing to continue. This question allowed more than one response option.

32
33 "None of the above"/"Prefer not to say" were mutually exclusive with other responses]

34
35 Q.4 Which of the following, if any, have you been diagnosed with? Please choose all that apply.

36
37
38 1: Bowel cancer

39
40
41 2: Lung cancer

42
43
44 3: Breast cancer

45
46
47 4: Cervical cancer

48
49
50 5: Prostate cancer

51
52 Other type of cancer - PEN WRITE IN

53
54
55 None of the above

56
57
58 Prefer not to say

1
2
3 [All Adults 16+ in England willing to continue. This question allowed more than one response option.

4
5 "None of the above"/"Prefer not to say" were mutually exclusive with other responses]

6
7
8 Q.5 Has anyone you know ever been diagnosed with breast cancer? Please choose all that apply.

9
10
11
12
13 1: A close family member

14
15
16 2: Any other family member

17
18
19 3: A friend

20
21
22 4: A colleague

23
24
25 5: Any other person

26
27 Not sure

28
29
30 Prefer not to say

31
32
33
34
35 [All females aged 16+ in England willing to continue]

36
37
38 Q.6 How often do you worry about your chances of getting breast cancer yourself?

39
40
41 1: Never

42
43
44 2: Occasionally

45
46
47 3: Sometimes

48
49
50 4: Often

51
52
53 5: Very often

54
55 Not sure

56
57 Prefer not to say

58
59
60 Thank you for answering these questions - this is the end of this section for you.

1
2
3
4
5
6 [All Adults 16+ in England willing to continue. Participants handed the tablet back to the interviewer,
7 who showed the screen and either read out or allowed participants to read subsequent questions]
8
9

10 Q.7 In May, it was reported that a computer algorithm failure had meant that a number of women did
11 not receive invitations to their final routine breast cancer screening. The Health Secretary, Jeremy
12 Hunt, said that women affected will be contacted by letter with an invitation for a catch-up screening
13 test but some of the women who were not invited for their final appointment may have had their lives
14 shortened.
15
16
17
18
19

20 Do you recall seeing or hearing anything about this news story before now?
21
22

23 1: Yes
24
25

26 2: No
27
28

29 Not sure
30
31
32
33
34

35 [All who recall seeing or hearing anything about this news story before now. This was a multiple
36 choice question. The order of response options was randomised with "other websites" always
37 following both "online news websites" and "social media websites"]
38
39
40

41 Q.8 Do you recall where you saw or heard this news story? Please choose all that apply.
42
43

44 1: Television
45
46

47 2: Print newspaper(s)
48
49

50 3: Radio
51
52

53 4: Online news websites
54
55

56 5: Social media websites
57
58

59 6: Other websites
60

1
2
3 7: Word of mouth
4

5
6 Other sources – PEN WRITE IN
7

8 Not sure
9
10

11
12
13
14 [All who recall seeing or hearing anything about this news story before now]
15

16
17 Q.9 Did you discuss or share the story with anyone else?
18

19 1: Yes
20

21
22 2: No
23

24
25 Not sure
26
27
28
29

30
31 [All who recall seeing or hearing anything about this news story before now. Participants were
32 randomised to one of two orders of response options (1:1)]
33

34
35 Q.10 The Health Secretary, Jeremy Hunt, gave an estimate of the number of women who had failed
36 to get invitations since 2009.
37

38
39
40 Which of the following do you think is the estimate that he gave?
41

42 1: 4,500 women
43

44
45 2: 45,000 women
46

47
48 3: 450,000 women
49

50
51 4: 4,500,000 women
52

53 Not sure
54
55
56
57
58
59
60

1
2
3 [All who recall seeing or hearing anything about this news story before now. Participants randomised
4 to one of two orders of response options (1:1)]
5
6

7
8 Q.11 The Health Secretary also gave an estimate, based on computer modelling, of the number of
9 women who may have had their lives shortened.
10

11
12 Which of the following do you think is the estimate that he gave?
13

14
15 1: Between 13 and 27 women
16

17
18 2: Between 135 and 270 women
19

20
21 3: Between 13 and 2,700 women
22

23
24 4: Between 1,350 and 2,700 women
25

26
27 Not sure
28
29
30
31

32 [All who gave an estimate in Q1 or Q11]
33

34 Q.12 How much did you trust these statistics when you heard them in the news?
35
36

37 1: Not at all
38

39
40 2: A little
41

42
43 3: Somewhat
44

45
46 4: A lot
47

48
49 Not sure
50
51
52

53 [All who do not trust the statistic]
54

55
56 Q.13 What were your reasons for not trusting these statistics when you heard them in the news?
57
58

59 PROBE: Any other reasons?
60

1
2
3 OPEN ENDED
4
5
6
7

8 [All who recall seeing or hearing anything about this news story before now]
9

10
11 Q.14 It was also reported that some health experts have said breast cancer screening can do “more
12 harm than good” because they believe “breast screening...has no impact on all-cause death”.
13
14

15
16 Do you recall seeing or hearing anything about this aspect of the news story before now?
17

18
19 1: Yes
20

21
22 2: No
23

24
25 Not sure
26
27
28
29

30 [All who recall seeing or hearing anything about this news story before now]
31

32 Q.15 The estimate of the number of women who may have had their lives shortened that the Health
33 Secretary gave was between 135 and 270. It was also reported that one statistics expert has said this
34 claim is “misleading” because they believe “there is only weak evidence that screening helps prolong
35 life, particularly for older women” and that “contrary to popular belief, screening also does harm...for
36 every 200 women attending screening between 50 and 70, we would expect one to have her early
37 death from breast cancer prevented, but three to be unnecessarily treated for a harmless cancer that
38 would not have troubled them”.
39
40
41
42
43
44
45
46
47
48
49

50 Do you recall seeing or hearing anything about this aspect of the news story before now?
51

52
53 1: Yes
54

55
56 2: No
57

58
59 Not sure
60

1
2
3
4
5
6 [All Adults 16+ in England willing to continue]
7

8 Q.16 In general, how much do you trust your general practitioner?
9

10
11 1: Not at all
12

13
14 2: A little
15

16
17 3: Somewhat
18

19
20 4: A lot
21

22
23 Not sure
24
25
26
27

28 [All Adults 16+ in England willing to continue]
29

30 Q.17 In general, how much do you trust the NHS?
31

32
33 1: Not at all
34

35
36 2: A little
37

38
39 3: Somewhat
40

41
42 4: A lot
43

44
45 Not sure
46
47
48
49

50 [All Adults 16+ in England willing to continue]
51

52 Q.18 Routine screening means testing healthy people to find cancer before they have any symptoms.
53

54 Do you think routine cancer screening tests for healthy people are almost always a good idea?
55

56
57 1: Yes
58

59
60 2: No

1
2
3 Not sure
4
5
6
7

8 [Participants were handed an information card with the following text and asked to read it]
9

10
11 You may have some questions about breast cancer screening after this part of the survey. You can
12 find out more by calling the NHS on a Freephone number (0800 169 2692) or via the web on
13 <https://www.nhs.uk/conditions/breast-cancer-screening/missed-invitations/>.
14
15
16
17

18
19
20 [All Adults 16+ in England willing to continue]
21

22
23 Q.19 It was also reported in May that a volcano had erupted in Hawaii, leading to officials declaring a
24 state of emergency and mandatory evacuation of 1,700 residents in the area.
25

26
27 Do you recall seeing or hearing anything about this news story before now?
28

29
30
31 1: Yes
32

33
34 2: No
35

36
37 Not sure
38
39
40
41

42 [All Adults 16+ in England willing to continue]
43

44
45 Q.20 The results of local elections held in England were also reported in May. The Labour Party won
46 2,350 seats, the Conservative Party won 1,332 seats, and the Liberal Democrats won 536 seats.
47

48
49 Do you recall seeing or hearing anything about this news story before now?
50

51
52 1: Yes
53

54
55 2: No
56

57
58 Not sure
59
60

1
2
3 [All Adults 16+ in England willing to continue]
4
5

6 Q.21 Please can I ask you what is the highest level of qualification you have received?
7

8 1: A. Graduate level qualifications and above: including higher degrees, professional qualifications at
9 HE standard (e.g. chartered accountant, surveyor, Nursing, Teaching), NVQ and SVQ Level 4 or 5,
10 Higher Education Diplomas, HNC and HND and BTEC Higher, RSA Higher Diploma
11
12

13
14
15 2: B. A-levels and AS levels and equivalents: including SCE Higher, Scottish Certificate 6th Year
16 Studies, NVQ and SVQ and GSVQ level 3, GNVQ Advanced, ONC and OND and BTEC National,
17 City and Guilds Advanced Craft, City and Guilds Final level or Part III, RSA Advanced Diploma
18
19

20
21
22 3: C. Trade apprenticeships
23

24
25 4: D. GCSEs and equivalents: including O level, SCE Standard, CSEs, NVQ and SVQ and GSVQ
26 level 1 and 2, GNVQ and BTEC and SCOTVEC first, General diploma, City and Guilds Ordinary level,
27 City and Guilds Ordinary level Part II, RSA State I-III or Diploma, SCOTVEC modules
28
29

30
31 5: E. Other qualifications (including overseas)
32

33
34 6: F. No formal qualifications
35

36 Don't know
37

38
39 Refused
40
41
42
43
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APPENDIX 2 – SUPPLEMENTARY TABLES

Table A – Summary statistics describing the sample

Measure	Total* (n=1,894)	%	(95% CI)
Awareness of the news about breast screening			
Aware of the main story and both follow-up commentaries	250	13.2	11.7 to 14.8
Aware of the main story and overdiagnosis follow-up	188	9.9	8.6 to 11.3
Aware of the main story and all-cause mortality follow-up	117	6.2	5.2 to 7.3
Aware of the main story only	709	37.4	35.3 to 39.6
Unaware of the story	630	33.3	31.2 to 35.4
Recruitment wave			
Wave 2: 20-26 th June	606	32.0	29.9 to 34.1
Wave 1: 6-10 th June	1,288	68.0	65.9 to 70.1
Gender			
Male	801	42.3	40.1 to 44.5
Female	1,093	57.7	55.5 to 59.9
Ethnicity			
White British	1,555	82.4	80.7 to 84.1
Other groups	331	17.6	15.9 to 19.3
Marital status			
Married or living as a married	1,039	54.9	52.6 to 57.1
Widowed, divorced and separated	382	20.2	18.4 to 22.0
Single	473	25.0	23.1 to 27.0
Highest level of education			
Graduate level qualifications and above	530	28.2	26.2 to 30.3
A-levels and AS levels and equivalents	461	24.6	22.7 to 26.5
GCSEs and equivalents	459	24.5	22.5 to 26.4
Trade apprenticeships or other qualifications	93	5.0	4.0 to 6.0
No formal qualifications	334	17.8	16.1 to 19.6
Social class grade			
Grade A or B	336	17.7	16.1 to 19.5
Grade C1	539	28.5	26.5 to 30.5
Grade C2	423	22.3	20.5 to 24.3
Grade D or E	596	31.5	29.4 to 33.6
Employment status			
Working	862	45.5	43.3 to 47.8
Not working	1,032	54.5	52.2 to 56.7
Area type			
Urban	1,542	81.4	79.6 to 83.1
Rural	352	18.6	16.9 to 20.4
Personal diagnosis of cancer			
Yes	156	8.4	7.2 to 9.7
No	1,705	91.6	90.3 to 92.8
Personal experience of breast screening			
Taken part	441	23.7	21.8 to 25.7
Invited, never taken part	56	3.0	2.3 to 3.9
Not eligible or not invited	1,364	73.3	71.2 to 75.3
Belief that screening is almost always a good idea			
Yes	1,737	91.7	90.4 to 92.9
No or not sure	157	8.3	7.1 to 9.6
Awareness of the news about the volcanic eruption			
Yes	1,435	75.8	73.8 to 77.7
No or not sure	459	24.2	22.3 to 26.2
Awareness of the news about the local elections			
Yes	1,198	63.3	61.1 to 65.4
No or not sure	696	36.7	34.6 to 38.9
General level of trust in participants' GPs			
A lot	1,009	55.2	52.9 to 57.5
Somewhat	540	29.6	27.5 to 31.7
A little	219	12.0	10.6 to 13.5
Not at all	59	3.2	2.5 to 4.1
General level of trust in the NHS			

1	A lot	1,016	54.2	54.9 to 59.5
2	Somewhat	619	33.0	32.7 to 37.1
3	A little	184	9.8	9.0 to 11.8
4	Not at all	56	3.0	2.4 to 4.0
5	4 Frequency of worry about breast cancer			
6	Very often	46	4.6	3.4 to 6.0
7	Often	55	5.4	4.2 to 7.0
8	Sometimes	216	21.4	18.9 to 24.0
9	Occasionally	302	29.9	27.1 to 32.8
10	Never	391	38.7	35.7 to 41.7
11	10 Breast screening intentions for next invitation			
12	Yes, definitely	690	84.7	82.1 to 87.0
13	Yes, probably	88	10.8	8.8 to 13.1
14	No, probably not	18	2.2	1.4 to 3.4
15	No, definitely not	19	2.3	1.5 to 3.5

Table B – Full results of the binary logistic regression model testing for variables associated with whether participants responded to questions on the survey module

		Responded vs. Did not respond to the survey questions: n (%)		Adjusted OR, 95% CI	p-value	
Characteristic	Total (n=2,665)	Did not respond (n=779; 29.2%)	Responded (n=1,886; 70.8%)	Responded to questions (vs. Did not respond)		
26 Recruitment wave						
Wave 2: 20-26 th June	908	303 (33.4)	605 (66.6)	0.73, 0.61 to 0.87	<.0005	
vs. Wave 1: 6-10 th June	1,757	476 (27.1)	1,281 (72.9)			
29 Gender						
Male	1,270	474 (37.3)	796 (62.7)	0.46, 0.39 to 0.55	<.0005	
vs. Female	1,395	305 (21.9)	1,090 (78.1)			
32 Ethnicity						
White British	2,139	584 (27.3)	1,555 (72.7)	1.69, 1.37 to 2.10	<.0005	
vs. Other groups	526	195 (37.1)	331 (62.9)			
35 Marital status						
Married/Living as a couple	1,441	407 (28.2)	1,034 (71.8)	1.48, 1.18 to 1.85	Overall: .001	
Widowed/Divorced/Separated	517	135 (26.1)	382 (73.9)		.001	
vs. Single	707	237 (33.5)	470 (66.5)		.002	
39 Social class grade						
Grade A or B	450	115 (25.6)	335 (74.4)	1.54, 1.18 to 2.02	Overall: .003	
Grade C1	726	190 (26.2)	536 (73.8)			.002
Grade C2	596	174 (29.2)	422 (70.8)			.002
vs. Grade D or E	893	300 (33.6)	593 (66.4)			.045
44 Employment status						
Working	1,225	366 (29.9)	859 (70.1)	0.79, 0.65 to 0.97	.026	
vs. Not working	1,440	413 (28.7)	1,027 (71.3)			
47 Area type						
Urban	2,164	629 (29.1)	1,535 (70.9)	1.14, 0.91 to 1.42	.246	
vs. Rural	501	150 (29.9)	351 (70.1)			
49 Age (in years)						
	2,665	52.1 (21.0)	50.8 (20.5)	0.99, 0.98 to 1.00	<.0005	

Table C – Sources of news about the breast screening story

Source of information	Total (n=1,264)	%	(95% CI)
Television	971	76.8	74.4 to 79.1
Radio	271	21.4	19.2 to 23.8
Print newspaper(s)	169	13.4	11.6 to 15.3
Online news websites	134	10.6	9.0 to 12.4
Social media websites	68	5.4	4.2 to 6.7
Other websites	11	0.9	0.5 to 1.5

Word of mouth	43	3.4	2.5 to 4.5
1 Other sources	8	0.6	0.3 to 1.2
2 Discussed or shared the	450	35.6	33.0 to 38.3
3 story with someone else			

Table D – Full results of the binary logistic regression model testing for an association between awareness of the breast screening media coverage and trust in participants' GPs

Characteristic	Total (n=1,746)	A lot vs. Not at all; a little; somewhat: n (%)		Adjusted OR, 95% CI (vs. Less than a lot)	p-value
		Less than a lot (n=781; 44.7%)	A lot (n=965; 55.3%)		
Screening story awareness					Overall: .729
Aware of the main story and both follow-up commentaries	238	98 (41.2)	140 (58.8)	1.10, 0.74 to 1.64	.653
Aware of the main story and overdiagnosis follow-up	172	66 (38.4)	106 (61.6)	1.31, 0.85 to 2.03	.218
Aware of the main story and all-cause mortality follow-up	107	49 (45.8)	58 (54.2)	1.21, 0.73 to 2.02	.459
Aware of the main story only	655	280 (42.7)	375 (57.3)	1.17, 0.88 to 1.57	.283
vs. Unaware of the story	574	288 (50.2)	286 (49.8)		
Recruitment wave					
Wave 2: 20-26 th June	557	255 (45.8)	663 (55.8)	0.81, 0.64 to 1.04	.097
vs. Wave 1: 6-10 th June	1,189	526 (44.2)	302 (54.2)		
Gender					
Male	754	317 (42.0)	437 (58.0)	1.15, 0.86 to 1.54	.334
vs. Female	992	464 (46.8)	528 (53.2)		
Ethnicity					
White British	1,450	614 (42.3)	836 (57.7)	1.17, 0.85 to 1.61	.328
vs. Other groups	296	167 (54.4)	129 (43.6)		
Marital status					Overall: .504
Married/Living as a couple	964	422 (42.8)	542 (56.2)	1.04, 0.77 to 1.42	.782
Widowed/Divorced/Separated	341	139 (40.8)	202 (59.2)	0.86, 0.57 to 1.29	.460
vs. Single	441	220 (49.9)	221 (50.1)		
Highest level of education					Overall: .056
Graduate level/Above	494	230 (46.6)	264 (53.4)	0.64, 0.42 to 0.98	.042
A-levels/AS levels/Equivalent	438	201 (45.9)	237 (54.1)	0.70, 0.46 to 1.06	.089
GCSEs/Equivalent	429	213 (49.7)	216 (50.3)	0.63, 0.43 to 0.94	.022
Trade apprenticeships/Other	86	41 (47.7)	45 (52.3)	0.44, 0.25 to 0.80	.007
vs. No formal qualifications	299	96 (32.1)	203 (67.9)		
Social class grade					Overall: .711
Grade A or B	317	128 (40.4)	189 (59.6)	1.20, 0.82 to 1.76	.342
Grade C1	505	231 (45.7)	274 (54.3)	1.02, 0.74 to 1.39	.923
Grade C2	385	181 (47.0)	204 (53.0)	0.97, 0.70 to 1.36	.874
vs. Grade D or E	539	241 (44.7)	298 (55.3)		
Employment status					
Working	806	411 (51.0)	395 (49.0)	0.82, 0.63 to 1.07	.135
vs. Not working	940	370 (39.4)	570 (60.6)		
Area type					
Urban	1,420	635 (44.7)	785 (55.3)	1.12, 0.84 to 1.50	.430
vs. Rural	326	146 (44.8)	180 (55.2)		
Personal diagnosis of cancer					
Yes	1,599	718 (44.9)	881 (55.1)	0.84, 0.55 to 1.28	.404
vs. No	147	63 (42.9)	84 (57.1)		
Personal experience of breast screening					Overall: .284
Taken part	411	159 (38.7)	252 (61.3)	1.33, 0.91 to 1.95	.145
Invited, never taken part	48	21 (43.8)	27 (56.3)	0.95, 0.46 to 1.98	.894
vs. Not eligible or not invited	1,287	601 (46.7)	686 (53.3)		

1	Belief that screening is almost always a good idea					
2	Yes	1,609	701 (43.6)	908 (56.4)	1.30, 0.85 to 1.97	.230
3	vs. No or not sure	137	80 (58.4)	57 (41.6)		
4	Awareness of volcano news					
5	Yes	1,332	565 (42.4)	767 (57.6)	1.04, 0.77 to 1.40	.789
6	vs. No or not sure	414	216 (52.2)	198 (47.8)		
7	Awareness of election news					
8	Yes	1,114	467 (41.9)	647 (58.1)	1.19, 0.93 to 1.54	.172
9	vs. No or not sure	632	314 (49.7)	318 (50.3)		
10	General level of trust in the NHS					Overall: <.0005
11	A lot	943	202 (21.4)	741 (78.6)	13.53, 6.65 to 27.54	<.0005
12	Somewhat	589	409 (69.4)	180 (30.6)	1.62, 0.80 to 3.31	.183
13	A little	163	130 (79.8)	33 (20.2)	1.00, 0.46 to 2.21	.994
14	vs. Not at all	51	40 (78.4)	11 (21.6)		
15	Age (in years)	1,746	46.9 (19.1)	53.9 (21.0)	1.01, 1.00 to 1.02	.087
16						
17						
18						
19	Table E – Full results of the binary logistic regression model testing for an association between awareness of the					
20	breast screening media coverage and trust in the NHS					
21						
22						
23			A lot vs. Not at all; a little; somewhat:		Adjusted OR, 95% CI	p-value
24			n (%)			
25		Total	Less than a lot	A lot	A lot	
26	Characteristic	(n=1,746)	(n=803; 46.0%)	(n=943; 54.0%)	(vs. Less than a lot)	
27	Screening story awareness					Overall: .290
28	Aware of the main story and both follow-up commentaries	238	102 (42.9)	136 (57.1)	0.87, 0.59 to 1.30	.503
29	Aware of the main story and overdiagnosis follow-up	172	76 (44.2)	96 (55.8)	0.78, 0.51 to 1.21	.267
30	Aware of the main story and all-cause mortality follow-up	107	57 (53.3)	50 (46.7)	0.58, 0.35 to 0.97	.039
31	Aware of the main story only	655	299 (45.6)	356 (54.4)	0.81, 0.60 to 1.09	.160
32	vs. Unaware of the story	574	269 (46.9)	305 (53.1)		
33	Recruitment wave					
34	Wave 2: 20-26 th June	557	248 (44.5)	309 (55.5)	1.21, 0.95 to 1.55	.118
35	vs. Wave 1: 6-10 th June	1,189	555 (46.7)	634 (53.3)		
36	Age					Overall: .052
37	65+	530	198 (37.4)	332 (62.6)	1.04, 0.61 to 1.79	.880
38	55-64	245	111 (45.3)	134 (54.7)	0.76, 0.44 to 1.30	.309
39	45-54	235	115 (48.9)	120 (51.1)	0.83, 0.50 to 1.39	.484
40	35-44	245	135 (55.1)	110 (44.9)	0.59, 0.36 to 0.96	.035
41	25-34	265	152 (57.4)	113 (42.6)	0.56, 0.35 to 0.91	.018
42	vs. 16-24	226	92 (40.7)	134 (59.3)		
43	Gender					
44	Male	754	319 (42.3)	435 (57.7)	0.99, 0.73 to 1.33	.985
45	vs. Female	992	484 (48.8)	508 (51.2)		
46	Ethnicity					
47	White British	1,450	634 (43.7)	816 (56.3)	1.47, 1.07 to 2.02	.019
48	vs. Other groups	296	169 (57.1)	127 (42.9)		
49	Marital status					Overall: .870
50	Married/Living as a couple	964	440 (45.6)	524 (54.4)	1.07, 0.78 to 1.47	.685
51	Widowed/Divorced/Separated	341	151 (44.3)	190 (55.7)	1.00, 0.66 to 1.50	.990
52	vs. Single	441	212 (48.1)	229 (51.9)		
53	Highest level of education					Overall: .076
54	Graduate level/Above	494	233 (47.2)	261 (52.8)	1.20, 0.79 to 1.83	.386
55	A-levels/AS levels/Equivalent	438	199 (45.4)	239 (54.6)	1.12, 0.75 to 1.67	.582
56	GCSEs/Equivalent	429	224 (52.2)	205 (47.8)	0.86, 0.59 to 1.26	.447
57	Trade apprenticeships/Other	86	32 (37.2)	54 (62.8)	1.85, 1.01 to 3.39	.047
58	vs. No formal qualifications	299	115 (38.5)	184 (61.5)		

Social class grade					Overall: .990
1	Grade A or B	317	140 (44.2)	177 (55.8)	0.96, 0.65 to 1.41
2	Grade C1	505	232 (45.9)	273 (54.1)	0.99, 0.72 to 1.37
3	Grade C2	385	179 (46.5)	206 (53.5)	1.02, 0.73 to 1.43
4	vs. Grade D or E	539	252 (46.8)	206 (53.5)	.828 .968 .892
Employment status					
6	Working	806	410 (50.9)	396 (49.1)	0.94, 0.71 to 1.25
7	vs. Not working	940	393 (41.8)	547 (58.2)	.673
Area type					
9	Urban	1,420	656 (46.2)	764 (53.8)	0.96, 0.72 to 1.29
10	vs. Rural	326	147 (45.1)	179 (54.9)	.795
Personal diagnosis of cancer					
12	Yes	1,599	737 (46.1)	862 (53.9)	1.00, 0.66 to 1.50
13	vs. No	147	66 (44.9)	81 (55.1)	.994
Personal experience of breast screening					Overall: .062
16	Taken part	411	193 (47.0)	218 (53.0)	0.65, 0.43 to 0.97
17	Invited, never taken part	48	20 (41.7)	28 (58.3)	1.10, 0.51 to 2.35
18	vs. Not eligible or not invited	1,287	590 (45.8)	697 (54.2)	.035 .813
Belief that screening is almost always a good idea					
20	Yes	1,609	715 (44.4)	894 (55.6)	1.96, 1.28 to 3.00
21	vs. No or not sure	137	88 (64.2)	49 (35.8)	.002
Awareness of volcano news					
23	Yes	1,332	594 (44.6)	738 (55.4)	1.00, 0.74 to 1.35
24	vs. No or not sure	414	209 (50.5)	205 (49.5)	.987
Awareness of election news					
26	Yes	1,114	491 (44.1)	623 (55.9)	1.03, 0.80 1.33
27	vs. No or not sure	632	312 (49.4)	320 (50.6)	.817
General level of trust in participants' GPs					Overall: <.0005
30	A lot	965	224 (23.2)	741 (76.8)	11.98, 6.07 to 23.64
31	Somewhat	513	370 (72.1)	143 (27.9)	1.39, 0.70 to 2.76
32	A little	212	165 (77.8)	47 (22.2)	1.12, 0.54 to 2.33
33	vs. Not at all	56	44 (78.6)	12 (21.4)	<.0005 .350 .770

Table F – Full results of the binary logistic regression model testing for an association between awareness of the breast screening media coverage and frequency of worry about breast cancer

Characteristic	Total (n=700)	Never; occasionally vs. Sometimes; often; very often: n (%) / M (SD)		Adjusted OR, 95% CI	p-value
		Never; occasionally (n=441; 63.0%)	Sometimes; often; very often (n=259; 37.0%)		
Screening story awareness					Overall: .198
Aware of the main story and both follow-up commentaries	88	65 (73.9)	23 (26.1)	0.85, 0.46 to 1.58	.614
Aware of the main story and overdiagnosis follow-up	63	42 (66.7)	21 (33.3)	1.05, 0.55 to 2.01	.878
Aware of the main story and all-cause mortality follow-up	36	25 (69.4)	11 (30.6)	1.10, 0.49 to 2.49	.819
Aware of the main story only	270	153 (56.7)	117 (43.3)	1.49, 0.98 to 2.25	.062
vs. Unaware of the story	243	156 (64.2)	87 (35.8)		
Recruitment wave					
Wave 2: 20-26 th June	229	152 (66.4)	77 (33.6)	0.83, 0.58 to 1.19	.304
vs. Wave 1: 6-10 th June	471	289 (61.4)	182 (38.6)		
Ethnicity					
White British	563	354 (62.9)	209 (37.1)	0.90, 0.58 to 1.39	.635
vs. Other groups	137	87 (63.5)	50 (36.5)		
Marital status					Overall: .272

1	Married/Living as a couple	403	255 (63.3)	148 (36.7)	1.14, 0.76 to 1.72	.519
2	Widowed/Divorced/Separated vs. Single	100 197	58 (58.0) 128 (65.0)	42 (42.0) 69 (35.0)	1.61, 0.90 to 2.87	.110
3	Highest level of education					Overall: .026
4	Graduate level/Above	230	149 (64.8)	81 (35.2)	0.40, 0.21 to 0.79	.008
5	A-levels/AS levels/Equivalentents	206	138 (67.0)	68 (33.0)	0.67, 0.19 to 0.70	.002
6	GCSEs/Equivalentents	176	105 (59.7)	71 (40.3)	0.57, 0.31 to 1.04	.068
7	Trade apprenticeships/Other	17	12 (70.6)	5 (29.4)	0.33, 0.10 to 1.10	.072
8	vs. No formal qualifications	71	37 (52.1)	34 (47.9)		
9	Social class grade					Overall: .704
10	Grade A or B	125	84 (67.2)	41 (32.8)	1.07, 0.60 to 1.90	.819
11	Grade C1	209	123 (58.9)	86 (41.1)	1.31, 0.80 to 2.13	.282
12	Grade C2	165	105 (63.6)	60 (36.4)	1.11, 0.67 to 1.83	.691
13	vs. Grade D or E	201	129 (64.2)	72 (35.8)		
14	Employment status					
15	Working	392	239 (61.0)	153 (39.0)	1.15, 0.81 to 1.64	.435
16	vs. Not working	308	202 (65.6)	106 (34.4)		
17	Area type					
18	Urban	574	366 (63.8)	208 (36.2)	0.83, 0.54 to 1.26	.378
19	vs. Rural	126	75 (59.5)	51 (40.5)		
20	Personal diagnosis of cancer					
21	Yes	44	26 (59.1)	18 (40.9)	1.62, 0.82 to 3.22	.169
22	vs. No	656	415 (63.3)	241 (36.7)		
23	Personal experience of breast screening					Overall: .428
24	Taken part	221	151 (68.3)	70 (31.7)	0.66, 0.36 to 1.23	.193
25	Invited, never taken part	34	23 (67.6)	11 (32.4)	0.75, 0.30 to 1.89	.537
26	vs. Not eligible or not invited	445	267 (60.0)	178 (40.0)		
27	Belief that screening is almost always a good idea					
28	Yes	660	412 (62.4)	248 (37.6)	1.12, 0.50 to 2.51	.779
29	vs. No or not sure	40	29 (72.5)	11 (27.5)		
31	Awareness of volcano news					
32	Yes	505	323 (64.0)	182 (36.0)	0.91, 0.61 to 1.36	.645
33	vs. No or not sure	195	118 (60.5)	77 (39.5)		
34	Awareness of election news					
35	Yes	424	275 (64.9)	149 (35.1)	0.84, 0.59 to 1.20	.340
36	vs. No or not sure	276	166 (60.1)	110 (39.9)		
37	General level of trust in participants' GPs					Overall: .791
38	A lot	339	220 (64.9)	119 (35.1)	1.26, 0.50 to 3.15	.626
39	Somewhat	221	131 (59.3)	90 (40.7)	1.47, 0.58 to 3.72	.412
40	A little	109	69 (63.3)	40 (36.7)	1.25, 0.49 to 3.22	.641
41	vs. Not at all	31	21 (67.7)	10 (32.3)		
43	General level of trust in the NHS					Overall: .744
44	A lot	344	223 (64.8)	121 (35.2)	1.14, 0.41 to 3.21	.802
45	Somewhat	257	151 (58.8)	106 (41.2)	1.39, 0.49 to 3.91	.535
46	A little	76	51 (67.1)	25 (32.9)	1.13, 0.38 to 3.36	.833
47	vs. Not at all	23	16 (69.6)	7 (30.4)		
48	Breast screening intentions for next invitation					Overall: .163
49	Yes, definitely	601	369 (61.4)	232 (38.6)	1.48, 0.47 to 4.68	.503
50	Yes, probably	70	49 (70.0)	21 (30.0)	0.93, 0.27 to 3.25	.913
51	No, probably not	13	12 (92.3)	1 (7.7)	0.25, 0.02 to 2.70	.254
52	vs. No, definitely not	16	11 (68.8)	5 (31.3)		
53	Age (in years)	700	43.7 (15.5)	41.8 (14.3)	0.99, 0.97 to 1.01	.463

Table G – Full results of the binary logistic regression model testing for an association between awareness of the breast screening media coverage and breast screening intentions

		Yes, definitely vs. Yes, probably; no, probably not; no, definitely not: n (%)		Adjusted OR, 95% CI	p-value	
		Total	No definite intention	Definite intention	Definite intention	
		(n=700)	(n=99; 14.1%)	(n=601; 85.9%)	(vs. No definite intention)	
Screening story awareness					Overall: .108	
6	Aware of the main story and both follow-up commentaries	88	10 (11.4)	78 (88.6)	2.01, 0.74 to 5.48	.172
8	Aware of the main story and overdiagnosis follow-up	63	4 (4.3)	59 (93.7)	2.66, 0.79 to 8.89	.113
10	Aware of the main story and all-cause mortality follow-up	36	6 (16.7)	30 (83.3)	0.66, 0.20 to 2.13	.486
12	Aware of the main story only	270	22 (8.1)	248 (91.9)	1.88, 0.99 to 3.57	.054
14	vs. Unaware of the story	243	57 (23.5)	186 (76.5)		
Recruitment wave						
16	Wave 2: 20-26 th June	229	40 (17.5)	189 (82.5)	0.71, 0.42 to 1.21	.211
17	vs. Wave 1: 6-10 th June	471	59 (12.5)	412 (87.5)		
Age						Overall: .050
19	65+	69	7 (10.1)	62 (89.9)	0.84, 0.13 to 5.37	.855
20	55-64	123	5 (4.1)	118 (95.9)	2.49, 0.42 to 14.74	.313
21	45-54	128	10 (7.8)	118 (92.2)	3.59, 1.10 to 11.69	.034
22	35-44	143	21 (14.7)	122 (85.3)	2.72, 1.16 to 6.41	.022
23	25-34	144	29 (20.1)	115 (79.9)	2.82, 1.24 to 6.42	.014
24	vs. 16-24	93	27 (29.0)	66 (71.0)		
Ethnicity						
25	White British	563	72 (12.8)	491 (87.2)	0.96, 0.51 to 1.83	.905
26	vs. Other groups	137	27 (19.7)	110 (80.3)		
Marital status						Overall: .321
28	Married/Living as a couple	403	49 (12.2)	354 (87.8)	0.99, 0.53 to 1.84	.970
29	Widowed/Divorced/Separated	100	6 (6.0)	94 (94.0)	2.18, 0.73 to 6.53	.163
30	vs. Single	197	44 (22.3)	153 (77.7)		
Highest level of education						Overall: .169
32	Graduate level/Above	230	35 (15.2)	195 (84.8)	0.69, 0.22 to 2.20	.533
33	A-levels/AS levels/Equivalent	206	35 (17.0)	171 (83.0)	0.87, 0.29 to 2.62	.808
34	GCSEs/Equivalent	176	19 (10.8)	157 (89.2)	1.92, 0.62 to 5.92	.259
35	Trade apprenticeships/Other	17	3 (17.6)	14 (82.4)	1.38, 0.24 to 0.81	.720
36	vs. No formal qualifications	71	7 (9.9)	64 (90.1)		
Social class grade						Overall: .186
38	Grade A or B	125	14 (11.2)	111 (88.8)	1.87, 0.76 to 4.61	.177
39	Grade C1	209	25 (12.0)	184 (88.0)	2.36, 1.08 to 5.16	.032
40	Grade C2	165	24 (14.5)	141 (85.5)	1.85, 0.86 to 3.98	.118
41	vs. Grade D or E	201	36 (17.9)	165 (82.1)		
Employment status						
43	Working	392	56 (14.3)	336 (85.7)	0.70, 0.39 to 1.26	.238
44	vs. Not working	308	43 (14.0)	265 (86.0)		
Area type						
46	Urban	574	83 (14.5)	491 (85.5)	0.79, 0.39 to 1.59	.512
47	vs. Rural	126	16 (12.7)	110 (87.3)		
Personal diagnosis of cancer						
49	Yes	44	7 (15.9)	37 (84.1)	0.94, 0.30 to 2.98	.918
50	vs. No	656	92 (14.0)	564 (86.0)		
Personal experience of breast screening						Overall: .013
52	Taken part	221	9 (4.1)	212 (95.9)	6.12, 1.37 to 27.33	.018
53	Invited, never taken part	34	6 (17.6)	28 (82.4)	0.99, 0.21 to 4.61	.986
54	vs. Not eligible or not invited	445	84 (18.9)	361 (81.1)		
Belief that screening is almost always a good idea						
57	Yes	660	81 (12.3)	579 (87.7)	9.08, 3.77 to 21.88	<.0005
58	vs. No or not sure	40	18 (45.0)	22 (55.0)		
Awareness of volcano news						
60	Yes	505	54 (10.7)	451 (89.3)	1.34, 0.74 to 2.41	.335
	vs. No or not sure	195	45 (23.1)	150 (76.9)		

Awareness of election news						
1	Yes	424	47 (11.1)	377 (88.9)	1.42, 0.82 to 2.46	.208
2	vs. No or not sure	276	52 (18.8)	224 (81.2)		
General level of trust in participants' GPs						
					Overall: .025	
5	A lot	339	31 (9.1)	308 (90.9)	1.55, 0.45 to 5.29	.487
6	Somewhat	221	44 (19.9)	177 (80.1)	0.76, 0.23 to 5.67	.663
7	A little	109	16 (14.7)	93 (85.3)	2.48, 0.69 to 8.90	.163
8	vs. Not at all	31	8 (25.8)	23 (74.2)		
General level of trust in the NHS						
					Overall: .007	
10	A lot	344	34 (9.9)	310 (90.1)	1.16, 0.29 to 4.64	.832
11	Somewhat	257	42 (16.3)	215 (83.7)	0.70, 0.18 to 2.79	.614
12	A little	76	18 (23.7)	58 (76.3)	0.27, 0.06 to 1.11	.068
13	vs. Not at all	23	5 (21.7)	18 (78.3)		
Frequency of worry about breast cancer						
					Overall: .028	
15	Very often	39	3 (7.7)	36 (92.3)	3.00, 0.72 to 12.51	.132
16	Often	43	5 (9.3)	39 (90.7)	2.95, 0.85 to 10.26	.089
17	Sometimes	177	20 (11.3)	157 (88.7)	2.59, 1.31 to 5.15	.006
18	Occasionally	231	27 (11.7)	204 (88.3)	2.15, 1.15 to 4.02	.016
19	vs. Never	210	45 (21.4)	165 (78.6)		

Table H – Number of participants with missing data for each variable of interest

25 Measure	Total (n=1,894)
26 Awareness of the news about breast screening	0
27 Recruitment wave	0
28 Gender	0
29 Ethnicity	8
30 Marital status	0
31 Highest level of education	17
32 Social class grade	0
33 Employment status	0
34 Area type	0
35 Personal diagnosis of cancer	33
36 Personal experience of breast screening	33
37 Belief that screening is almost always a good idea	0
38 Awareness of the news about the volcanic eruption	0
39 Awareness of the news about the local elections	0
40 General level of trust in participants' GPs	67
41 General level of trust in the NHS	19
42 Frequency of worry about breast cancer	22
43 Breast screening intentions for next invitation	9

STROBE Statement—Checklist of items that should be included in reports of *cross-sectional studies*

	Item No	Recommendation	Page number
Title and abstract	1	(a) Indicate the study's design with a commonly used term in the title or the abstract	1
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	3-4
Objectives	3	State specific objectives, including any prespecified hypotheses	4
Methods			
Study design	4	Present key elements of study design early in the paper	4
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	4
Participants	6	(a) Give the eligibility criteria, and the sources and methods of selection of participants	4-5
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	5-7
Data sources/measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	5-7
Bias	9	Describe any efforts to address potential sources of bias	4-8
Study size	10	Explain how the study size was arrived at	5
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	7-8
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding	7-8
		(b) Describe any methods used to examine subgroups and interactions	7-8
		(c) Explain how missing data were addressed	8
		(d) If applicable, describe analytical methods taking account of sampling strategy	N/A
		(e) Describe any sensitivity analyses	N/A
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	8-13
		(b) Give reasons for non-participation at each stage	8
		(c) Consider use of a flow diagram	N/A
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	8-9
		(b) Indicate number of participants with missing data for each variable of interest	P8 (appendix 2)
Outcome data	15*	Report numbers of outcome events or summary measures	8-13
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	11-13

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		(b) Report category boundaries when continuous variables were categorized	11-13
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	N/A
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	N/A
Discussion			
Key results	18	Summarise key results with reference to study objectives	8-10
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	15-16
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	16
Generalisability	21	Discuss the generalisability (external validity) of the study results	14-16
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	16

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at www.strobe-statement.org.