

Supplementary materials for:

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Title: Impact of diagnostic invasiveness on the psychosocial consequences of false-positive mammography: cohort study

Supplementary material

Running title: Psychosocial consequences of false-positive mammography

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PROTOCOL

Introduction

A recent systematic review commissioned in the UK concludes that screening leads to a 20% reduction in breast cancer mortality.(1) However, in the Cochrane Systematic Review, a subgroup analysis that only included the trials with adequate randomization showed no evidence of breast cancer mortality reduction.(2) This controversy about the effectiveness of breast cancer screening makes the description and quantification of harms of mammography even more pressing. Among the more important harms of mammography mentioned in the Cochrane Systematic Review are overdiagnosis and overtreatment, and the psychological consequences of false-positive mammography.(2)

Psychosocial consequences have been assessed in systematic reviews of observational studies.(3–7) In general, studies using generic questionnaires often find no evidence of an association between false-positives and psychosocial consequences, while studies performed with condition-specific questionnaires show that association.(6,7) We have argued that generic questionnaires are inadequate to study psychosocial consequences of mammography screening. (8) Furthermore, the generic instruments' psychometric properties might even be inadequate in a population of women participating in mammography screening. They include irrelevant content and lack content coverage, making them insensitive and unspecific instruments. Thus, their use leads to a bias toward the null which may explain some of the negative results. Others have interpreted this discrepancy differently, suggesting that there is evidence of psychosocial distress but not of clinically recognizable anxiety.(7)

In a cohort of women screened with mammography and followed-up for 36 months, we have shown that false-positive screening mammography is associated with long-term psychosocial distress.(9) One unresolved issue is whether the distress is restricted to women with invasive procedures (biopsy or surgery) or if women managed only with additional imaging tests also experience harm.(10) There are two studies that assessed the long-term psychosocial consequences of mammography screening and also if there were differences due to the invasiveness of diagnostic procedures after a false-positive result. A British study found that women who had undergone biopsy or fine-needle aspiration cytology were more likely to suffer psychological consequences than women that received a clear result after screening mammography. However, there was no evidence of difference in psychological consequences between women who had only had additional imaging and women with clear results.(11) In contrast, a Swedish study found that both women that had invasive procedures (fine needle biopsy or surgery) and women who were managed non-invasively had higher anxiety levels than women with normal screening results.(12)

In the British cohort mentioned above, psychological consequences were measured also at 1 and 5 months after the positive screen. Women that were advised to have an early recall – i.e. to repeat the mammography 6 months after the abnormal screen –had distress levels at 5 months that were comparable to what they experienced 1 month after the abnormal screen. In contrast, women that had immediate final diagnosis (by imaging alone or after invasive procedures) had significant reductions in distress from one time point to another.(13) In spite of being managed non-invasively, at 35 months the early recall group had higher distress levels than women with clear results after the screening mammography. (11)

In summary, the existing literature suggests that women that had invasive procedures after false-positive mammography experience psychosocial harm, the results are conflicting for those that are managed by

imaging alone (which is the largest group of women with false-positive results), and the role of the 'time of uncertainty' has not been explicitly studied. In this study, we want to assess if the negative psychosocial consequences of false-positive mammography are restricted to subgroups of participants. To that effect, we will assess whether increasing invasiveness of diagnostic procedures after a positive mammography is associated with increased negative psychosocial consequences. Similarly, we will assess whether increasing waiting time from false-positive to receive information that there is no cancer is associated with increased negative psychosocial consequences. In comparison with the two previous studies, ours uses a questionnaire that was developed and validated to assess the long-term psychosocial consequences of mammography screening and uses statistical methods that address the problem of differential participant drop-out due to more negative psychosocial consequences.

Methods

Participants and data collection

The participants and data collection methods have been previously described.⁽⁹⁾ Briefly, women aged 50 to 69 years with abnormal findings were consecutively enrolled from the publicly financed mammography screening programs in Copenhagen and Funen, Denmark. For each woman with abnormal findings who accepted to participate, two additional women with normal mammography were also selected for this study (matched for screening clinic and day of screening appointment).

All recruited women received a multidimensional condition-specific questionnaire – the Consequences of Screening in Breast Cancer (COS-BC) questionnaire – whose content validity, psychometric properties and invariance in relation to time have been previously demonstrated.^(9,14,15) This questionnaire consists of two parts: part I measures the psychosocial consequences of abnormal screening mammography and has an item about sick leave; part II measures the long-term psychosocial consequences of false-positives. Higher scores in part I reflect greater negative psychosocial consequences. Higher scores in part II reflect changes in psychosocial dimensions, regardless of this experience being positive or negative.

The women with abnormal results were asked to complete the part I of the COS-BC when they attended the recall clinic. The remainder women were mailed the part I of the COS-BC one week after receiving the letter with the normal results of the mammography. Subsequently the COS-BC (parts I and II) was mailed to women from both groups at the same time points. The questionnaire was mailed 1, 6, 18 and 36 months after their final diagnosis. Women were asked to return the questionnaires using a pre-stamped return envelope. A reminder was sent within 2 weeks if no response was obtained.

Data about age, employment status, social consequences, and whether the woman was living alone was collected with the first questionnaire. For women without abnormal findings, the date of the letter with the normal results was collected from the medical records. Similarly, for women with abnormal findings the date of the letter telling about the need for further testing, the date of final diagnosis (either false-positive or confirmed cancer) and the most invasive diagnostic procedure performed were also collected from the medical records.

Exposures, outcomes, confounders and missing data

In the original project we had defined exposure in three categories: no abnormalities, false-positive and breast cancer. All women not recalled for additional examinations were classified as having normal results; otherwise, they were classified as having abnormal results. If, after investigation of the abnormal screening mammography, no cancer was found, the woman was classified as having false-positive; if cancer was found, she was classified as having breast cancer. The Danish mammography screening program does not

use BI-RADS categories explicitly. However, we assess that the normal group would include BI-RADS 1 and 2 categories. The abnormal results are most likely similar to a group that includes BI-RADS 0, BI-RADS 3-5 and women recalled due to a "technical recall".

In the current project, we will look at exposures in two perspectives: one that includes the type of investigation and another that includes time until diagnosis. For the first analysis, we will define exposure as a polytomous variable with six levels. We will keep the no abnormalities and the breast cancer groups from the original analysis, but we will subdivide the false-positives group according to the most invasive diagnostic procedure. Exposure levels will be: 1) no abnormalities, 2.a) false-positive followed only by additional imaging procedures, 2.b) false-positive followed by mammography repetition within 3-6 months (early recall), 2.c) false-positive investigated through biopsy, 2.d) false-positive investigated through surgery, and 3) breast cancer. In the second analysis, we will also keep the no abnormalities and the breast cancer groups from the original analysis, but we will subdivide the false-positives group according to the 'time of uncertainty', i.e. the time span between getting the letter of recall (stating that there was some abnormality in the screening test) and getting the final diagnosis (either that the abnormality was a cancer or a benign finding).

We will consider 12 psychosocial outcomes; one for each dimension of the COS-BC. This questionnaire has 2 single items and 10 scales (6 in part I and 4 in part II). The two single items are "felt less attractive" and "busy to take my mind off things". The scales cover sense of dejection, anxiety, negative impact on behavior, sleep disturbance, the degree of breast self-examination, negative impact on sexuality, worries about breast cancer, inner calm, social network and existential values.

We have collected data on 5 potential confounders: age, social class, education, employment, and whether the woman lived alone.

Whenever one item in a scale was not completed, the scale was set to missing. In addition, for the scale about sexuality, women could reply that the items were "not applicable". In this case, the scale was set to missing. Missing single-items or scales set to missing were not included in the analyses.

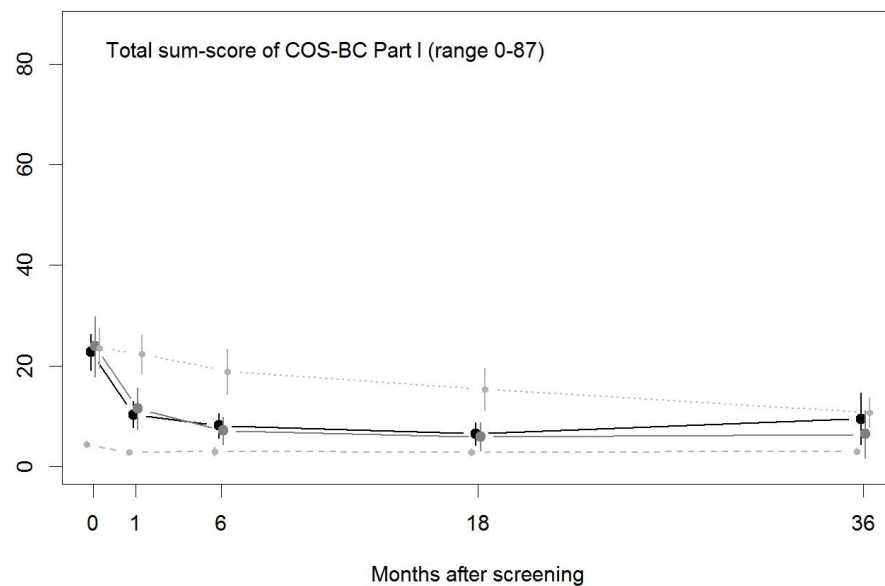
Statistical analyses

Baseline data across the 6 categories of exposure will be compared with the χ^2 test for categorical data and with the Wilcoxon signed rank test for continuous variables. The development throughout time of the mean score for each of the 12 outcomes stratified by the 6 categories of exposure will be analyzed in linear regression models. We will use both a crude model and a model adjusted for the 5 potential confounders. Generalized estimating equation methods will be used to account for repeated measurement on the same woman. During the follow-up, it is likely that participation is determined by the exposure category and by the psychosocial consequences. Inverse probability weighting methods were used to address the potential differential drop-out. (8) We will define a significance level of $P < 0.01$ to avoid type 1 error from multiple testing.

The study was approved by the Danish Data Protection Agency, 2007-41-0777. Approval from the ethics committee was not required.

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Supplementary figure 1: Psychosocial consequences of abnormal screening mammography through time using the mean sum-score of part-1 of COS-BC. This sum-score is calculated by adding the raw scores of all 29 items in part-1 of the COS-BC. This sum-score is a post-hoc outcome that was used to explore whether lack of difference between groups in the pre-specified analysis could be due to overly conservative significance (details in the Methods, under 'statistical analysis'). The graph shows the sum-score (y axis) for the 2 groups of women with false-positive mammography at 5 time points: 0, 1, 6, 18, and 36 months (y axis). The mean scores for women with breast cancer and women with normal mammography are given for completeness. † Significant difference between women with false-positives that were managed invasively and women with normal results. * Significant difference between women with false-positives that were managed non-invasively and women with normal results. Significance level at $P < 0.05$.

Supplementary table 1: Baseline characteristics of the whole cohort, including women with early recalls, women with normal mammography and women with breast cancer

		Number of participants with complete data	Screening result					
			Total (n=1310)	Normal (n=864)	Non-invasive (n=170)	False-positive (n=82)		Early recall (n=20)
						Needle biopsy (n=50)	Surgery (n=32)	
		n/n/n/n/n/n ^(a)	n (%) / Median (IQR)	n (%) / Median (IQR)	n (%) / Median (IQR)	n (%) / Median (IQR)	n (%) / Median (IQR)	n (%) / Median (IQR)
Age	50-54	864/170/50/32/20/174	367 (28.0)	217 (25.1)	75 (44.1)	19 (38.0)	12 (37.5)	6 (30.0)
	55-59		415 (31.7)	310 (35.9)	42 (24.7)	15 (30.0)	5 (15.6)	4 (20.0)
	60-64		303 (23.1)	210 (24.3)	27 (15.9)	11 (22.0)	5 (15.6)	5 (25.0)
	≥65		225 (17.2)	127 (14.7)	26 (15.3)	5 (10.0)	10 (31.3)	5 (25.0)
Age		864/170/50/32/20/174	58.6 (54.4 ; 63.3)	58.7 (55.0 ; 62.7)	56.8 (52.8 ; 61.7)	56.5 (53.4 ; 60.8)	58.1 (52.1 ; 66.5)	60.3 (53.8 ; 64.5)
Living alone	No	847/166/50/28/20/168	922 (72.1)	611 (72.1)	121 (72.9)	30 (60.0)	22 (78.6)	13 (65.0)
	Yes		357 (27.9)	236 (27.9)	45 (27.1)	20 (40.0)	6 (21.4)	7 (35.0)
Employment	Working ^(b)	845/166/50/28/20/168	696 (54.5)	467 (55.3)	92 (55.4)	31 (62.0)	15 (53.6)	9 (45.0)
	Unemployed		51 (4.0)	38 (4.5)	6 (11.8)	2 (4.0)	0 (0.0)	0 (0.0)
	Pensioned		530 (41.5)	340 (40.2)	68 (41.0)	17 (34.0)	13 (46.4)	11 (55.0)
Social status	I	847/165/50/28/20/168	42 (3.3)	32 (3.8)	3 (1.8)	1 (2.0)	1 (3.6)	0 (0.0)
	II		188 (14.7)	128 (15.1)	26 (15.8)	8 (16.0)	2 (7.1)	5 (15.0)
	III		251 (19.6)	165 (19.5)	29 (17.6)	15 (30.0)	5 (17.9)	4 (20.0)
	IV		461 (36.1)	312 (36.8)	60 (36.4)	16 (32.0)	11 (39.3)	7 (35.0)
	V		336 (26.3)	210 (24.8)	47 (28.5)	10 (20.0)	9 (32.1)	4 (20.0)

^a Number of participant with complete data is presented in the following order: normal results, non-invasive, needle biopsy, surgery and early recall; ^b Includes 5 students.

Supplementary table 2: Adjusted analyses of psychosocial consequences of breast cancer screening. Comparison between women managed invasively and women managed non-invasively. Women put on early recall were included in the non-invasive category. All analyses were adjusted for age, social class, employment, and whether the woman lived alone.

	Scale	Range	Non-invasive: mean differences (confidence interval)				
			Baseline	1 month	6 months	18 months	36 months
Invasive	Dejection	0-18	-0.02 (-1.79 to 1.76)	0.81 (-0.82 to 2.43)	0.05 (-1.05 to 1.15)	0.64 (-0.84 to 2.12)	-0.20 (-1.44 to 1.05)
	Anxiety	0-18	-0.17 (-1.95 to 1.61)	0.87 (-0.71 to 2.46)	0.38 (-1.02 to 1.79)	0.38 (-0.83 to 1.59)	-0.59 (-2.13 to 0.94)
	Negative impact on behaviour	0-21	-0.11 (-1.61 to 1.40)	0.78 (-0.61 to 2.17)	0.27 (-1.07 to 1.62)	0.41 (-0.95 to 1.77)	-0.59 (-1.91 to 0.72)
	Negative impact on sleep	0-12	-0.10 (-1.42 to 1.23)	0.81 (-0.33 to 1.95)	-0.07 (-0.97 to 0.83)	0.51 (-1.01 to 2.03)	-0.48 (-1.72 to 0.76)
	Breast examination	0-6	0.10 (-0.53 to 0.72)	-0.04 (-0.57 to 0.49)	0.02 (-0.61 to 0.66)	-0.03 (-0.55 to 0.48)	-0.06 (-0.67 to 0.55)
	Negative impact on sexuality	0-6	0.50 (-0.47 to 1.47)	0.14 (-0.44 to 0.71)	-0.16 (-0.90 to 0.58)	0.00 (-0.39 to 0.39)	-0.21 (-0.92 to 0.51)
	Felt less attractive	0-3	-0.06 (-0.23 to 0.11)	0.01 (-0.14 to 0.16)	0.09 (-0.20 to 0.37)	0.12 (-0.20 to 0.45)	0.03 (-0.16 to 0.22)
	Keeping mind of things	0-3	0.19 (-0.20 to 0.57)	0.17 (-0.16 to 0.50)	-0.11 (-0.41 to 0.19)	0.13 (-0.27 to 0.53)	-0.06 (-0.32 to 0.19)
	Worries about breast cancer	0-4		0.30 (-0.15 to 0.75)	0.07 (-0.53 to 0.67)	0.04 (-0.46 to 0.54)	0.18 (-0.28 to 0.64)
	Inner calm	0-4		0.07 (-0.35 to 0.49)	-0.24 (-0.77 to 0.29)	0.22 (-0.27 to 0.70)	-0.01 (-0.41 to 0.39)
	Social network	0-6		0.33 (-0.11 to 0.77)	0.02 (-0.59 to 0.63)	0.20 (-0.27 to 0.68)	0.19 (-0.26 to 0.64)
	Existential values	0-12		0.69 (-0.50 to 1.89)	0.48 (-0.92 to 1.88)	0.35 (-0.95 to 1.64)	-0.47 (-1.47 to 0.52)

Supplementary table 3: Psychosocial consequences of breast cancer screening: comparison between women with false-positive results and either women with normal results or women with breast cancer. Women put on early recall were excluded from the analysis. All analyses were adjusted for age, social class, employment, and whether the woman lived alone. Shaded cells highlight statistically significant differences (P<0.01).

Scale	Range	FP group	Comparison with participants with normal results: mean differences (99% confidence interval)					Comparison with participants with breast cancer: mean differences (99% confidence interval)				
			Baseline	1 month	6 months	18 months	36 months	Baseline	1 month	6 months	18 months	36 months
Dejection *	0-18	Invasive	6.01 (4.5 to 7.52)	3.09 (1.65 to 4.52)	0.82 (-0.26 to 1.90)	1.42 (0.08 to 2.76)	0.64 (-0.17 to 1.44)	-0.29 (-2.09 to 1.51)	-2.63 (-4.36 to -0.90)	-3.51 (-5.39 to -1.63)	-0.95 (-2.49 to 0.58)	-1.48 (-2.63 to -0.32)
		Non-invasive	6.15 (5.11 to 7.2)	2.30 (1.43 to 3.17)	0.65 (-0.15 to 1.44)	0.74 (0.07 to 1.40)	0.90 (-0.13 to 1.94)	-0.15 (-1.59 to 1.28)	-3.42 (-4.70 to -2.14)	-3.68 (-5.39 to -1.98)	-1.63 (-2.65 to -0.62)	-1.21 (-2.54 to 0.13)
Anxiety *	0-18	Invasive	5.63 (4.1 to 7.15)	3.00 (1.58 to 4.42)	1.27 (-0.09 to 2.63)	1.20 (0.14 to 2.25)	0.50 (-0.25 to 1.24)	-0.52 (-2.33 to 1.3)	-2.32 (-4.04 to -0.61)	-2.71 (-4.7 to -0.73)	-1.11 (-2.45 to 0.22)	-1.79 (-2.91 to -0.68)
		Non-invasive	5.90 (4.85 to 6.94)	2.16 (1.36 to 2.95)	0.86 (0.11 to 1.62)	0.76 (0.07 to 1.44)	1.20 (-0.23 to 2.64)	-0.25 (-1.68 to 1.18)	-3.17 (-4.39 to -1.94)	-3.12 (-4.75 to -1.5)	-1.55 (-2.62 to -0.48)	-1.09 (-2.76 to 0.59)
Negative impact on behaviour *	0-21	Invasive	3.58 (2.37 to 4.78)	2.27 (1.04 to 3.49)	0.93 (-0.27 to 2.14)	1.08 (-0.11 to 2.27)	0.32 (-0.41 to 1.04)	-0.38 (-1.91 to 1.15)	-2.43 (-3.96 to -0.91)	-3.07 (-4.88 to -1.27)	-1.15 (-2.67 to 0.38)	-1.41 (-2.52 to -0.31)
		Non-invasive	3.77 (2.78 to 4.77)	1.59 (0.82 to 2.37)	0.57 (-0.35 to 1.49)	0.68 (-0.06 to 1.43)	1.04 (-0.2 to 2.27)	-0.18 (-1.55 to 1.19)	-3.11 (-4.28 to -1.93)	-3.44 (-5.09 to -1.79)	-1.54 (-2.72 to -0.36)	-0.69 (-2.18 to 0.80)
Negative impact on sleep *	0-12	Invasive	2.71 (1.54 to 3.87)	1.82 (0.79 to 2.85)	0.38 (-0.35 to 1.10)	1.06 (-0.37 to 2.48)	0.42 (-0.37 to 1.22)	-0.20 (-1.57 to 1.16)	-1.34 (-2.62 to -0.07)	-2.65 (-4.04 to -1.25)	-0.95 (-2.62 to 0.71)	-1.08 (-2.06 to -0.09)
		Non-invasive	2.92 (2.21 to 3.63)	1.07 (0.48 to 1.66)	0.28 (-0.3 to 0.85)	0.52 (-0.01 to 1.05)	1.04 (-0.02 to 2.1)	0.01 (-1.00 to 1.02)	-2.09 (-3.04 to -1.14)	-2.75 (-4.03 to -1.47)	-1.49 (-2.44 to -0.54)	-0.46 (-1.67 to 0.74)
Breast examination *	0-6	Invasive	1.74 (1.21 to 2.26)	0.70 (0.26 to 1.13)	0.56 (-0.01 to 1.12)	0.37 (-0.08 to 0.82)	0.35 (-0.18 to 0.87)	-0.01 (-0.65 to 0.63)	-0.62 (-1.15 to -0.10)	-0.61 (-1.38 to 0.16)	-0.59 (-1.15 to -0.04)	-0.32 (-0.92 to 0.29)
		Non-invasive	1.64 (1.25 to 2.03)	0.75 (0.39 to 1.11)	0.50 (0.13 to 0.87)	0.43 (0.07 to 0.79)	0.42 (0.02 to 0.81)	-0.10 (-0.64 to 0.44)	-0.57 (-1.04 to -0.10)	-0.67 (-1.31 to -0.03)	-0.54 (-1.03 to -0.04)	-0.25 (-0.75 to 0.26)
Negative impact on sexuality *	0-6	Invasive	1.18 (0.30 to 2.06)	0.62 (0.12 to 1.12)	0.11 (-0.52 to 0.75)	0.08 (-0.26 to 0.41)	0.18 (-0.22 to 0.58)	0.13 (-0.96 to 1.21)	-1.55 (-2.32 to -0.77)	-1.68 (-2.65 to -0.71)	-1.21 (-1.88 to -0.55)	-0.84 (-1.48 to -0.20)
		Non-invasive	0.69 (0.22 to 1.16)	0.48 (0.13 to 0.82)	0.25 (-0.36 to 0.86)	0.05 (-0.24 to 0.35)	0.48 (-0.17 to 1.14)	-0.36 (-1.13 to 0.4)	-1.69 (-2.38 to -1.01)	-1.54 (-2.41 to -0.68)	-1.24 (-1.88 to -0.59)	-0.54 (-1.37 to 0.28)
Felt less attractive *	0-3	Invasive	0.12 (0.00 to 0.24)	0.10 (-0.03 to 0.22)	0.12 (-0.16 to 0.40)	0.20 (-0.09 to 0.49)	0.08 (-0.09 to 0.26)	-0.05 (-0.22 to 0.12)	-0.25 (-0.45 to -0.05)	-0.36 (-0.71 to -0.02)	-0.27 (-0.64 to 0.11)	-0.21 (-0.45 to 0.02)
		Non-invasive	0.2 (0.06 to 0.33)	0.08 (-0.01 to 0.17)	0.04 (-0.06 to 0.15)	0.08 (-0.05 to 0.21)	0.03 (-0.04 to 0.11)	0.03 (-0.15 to 0.20)	-0.27 (-0.44 to -0.09)	-0.44 (-0.68 to -0.20)	-0.39 (-0.69 to -0.09)	-0.26 (-0.44 to -0.09)
Keeping mind of things *	0-3	Invasive	1.24 (0.91 to 1.57)	0.55 (0.26 to 0.84)	0.11 (-0.13 to 0.36)	0.34 (-0.02 to 0.70)	0.11 (-0.07 to 0.3)	0.07 (-0.32 to 0.46)	-0.58 (-0.94 to -0.22)	-0.79 (-1.19 to -0.38)	-0.10 (-0.53 to 0.32)	-0.42 (-0.69 to -0.15)
		Non-invasive	1.08 (0.85 to 1.31)	0.41 (0.22 to 0.6)	0.15 (-0.08 to 0.39)	0.19 (0.03 to 0.35)	0.21 (0.00 to 0.42)	-0.09 (-0.40 to 0.22)	-0.72 (-1.01 to -0.44)	-0.75 (-1.15 to -0.35)	-0.26 (-0.51 to 0.00)	-0.32 (-0.6 to -0.03)
Worries about breast cancer *	0-4	Invasive		0.86 (0.47 to 1.25)	0.74 (0.21 to 1.28)	0.24 (-0.21 to 0.70)	0.24 (-0.17 to 0.64)					
		Non-invasive		0.57 (0.28 to 0.86)	0.44 (-0.09 to 0.98)	0.18 (-0.09 to 0.45)	0.07 (-0.22 to 0.36)					
Inner calm *	0-4	Invasive		0.69 (0.33 to 1.05)	0.32 (-0.13 to 0.76)	0.31 (-0.14 to 0.75)	0.01 (-0.31 to 0.34)		-0.13 (-0.56 to 0.30)	-0.29 (-0.77 to 0.19)	-0.20 (-0.71 to 0.30)	-0.40 (-0.84 to 0.03)
		Non-invasive		0.64 (0.36 to 0.92)	0.28 (-0.16 to 0.72)	0.08 (-0.21 to 0.37)	0.08 (-0.23 to 0.39)		-0.18 (-0.55 to 0.18)	-0.33 (-0.78 to 0.12)	-0.43 (-0.81 to -0.04)	-0.33 (-0.76 to 0.10)
Social network *	0-6	Invasive		0.65 (0.27 to 1.03)	0.43 (-0.13 to 0.99)	0.42 (0.03 to 0.82)	0.34 (-0.07 to 0.74)		-0.76 (-1.26 to -0.25)	-0.43 (-1.03 to 0.17)	-0.62 (-1.13 to -0.11)	-0.34 (-0.85 to 0.17)
		Non-invasive		0.35 (0.09 to 0.60)	0.18 (-0.28 to 0.64)	0.22 (-0.08 to 0.52)	0.12 (-0.09 to 0.34)		-1.06 (-1.49 to -0.64)	-0.68 (-1.17 to -0.19)	-0.83 (-1.27 to -0.38)	-0.56 (-0.94 to -0.18)
Existential values *	0-12	Invasive		2.96 (1.94 to 3.99)	2.19 (0.89 to 3.49)	1.79 (0.69 to 2.9)	0.44 (-0.35 to 1.23)		-0.22 (-1.44 to 1.01)	-0.87 (-2.36 to 0.62)	-1.07 (-2.39 to 0.26)	-2.00 (-3.12 to -0.87)
		Non-invasive		2.32 (1.62 to 3.01)	1.19 (0.24 to 2.14)	1.46 (0.66 to 2.27)	0.99 (0.23 to 1.74)		-0.86 (-1.82 to 0.10)	-1.86 (-3.05 to -0.68)	-1.40 (-2.48 to -0.32)	-1.45 (-2.55 to -0.35)

Supplementary table 4: Psychosocial consequences of breast cancer screening: comparison between women with false-positive results and either women with normal results or women with breast cancer. Women put on early recall were included in the non-invasive category. All analyses were adjusted for age, social class, employment, and whether the woman lived alone. Shaded cells highlight when differences were statistically different (P<0.01); cells in bold highlight differences that became significant after inclusion of women who were put on early recall.

Scale	Range	FP group	Comparison with participants with normal results: mean differences (99% confidence interval)					Comparison with participants with breast cancer: mean differences (99% confidence interval)				
			Baseline	1 month	6 months	18 months	36 months	Baseline	1 month	6 months	18 months	36 months
Dejection	0-18	Invasive	6.00 (4.49 to 7.52)	3.09 (1.65 to 4.53)	0.83 (-0.25 to 1.9)	1.41 (0.07 to 2.76)	0.63 (-0.17 to 1.44)	-0.31 (-2.11 to 1.50)	-2.64 (-4.37 to -0.90)	-3.49 (-5.37 to -1.62)	-0.95 (-2.48 to 0.59)	-1.48 (-2.63 to -0.32)
		Non-invasive	6.02 (5.04 to 7.00)	2.28 (1.46 to 3.10)	0.78 (0.02 to 1.53)	0.78 (0.13 to 1.43)	0.83 (-0.09 to 1.76)	-0.29 (-1.67 to 1.10)	-3.44 (-4.69 to -2.19)	-3.54 (-5.24 to -1.85)	-1.59 (-2.59 to -0.58)	-1.28 (-2.52 to -0.04)
Anxiety	0-18	Invasive	5.62 (4.09 to 7.15)	3.00 (1.57 to 4.42)	1.27 (-0.10 to 2.63)	1.19 (0.14 to 2.25)	0.49 (-0.25 to 1.24)	-0.53 (-2.35 to 1.28)	-2.33 (-4.05 to -0.61)	-2.73 (-4.71 to -0.74)	-1.11 (-2.44 to 0.22)	-1.80 (-2.92 to -0.68)
		Non-invasive	5.79 (4.82 to 6.76)	2.13 (1.37 to 2.88)	0.88 (0.2 to 1.56)	0.81 (0.14 to 1.48)	1.09 (-0.20 to 2.37)	-0.36 (-1.74 to 1.01)	-3.21 (-4.41 to -2.01)	-3.11 (-4.69 to -1.53)	-1.49 (-2.55 to -0.43)	-1.21 (-2.74 to 0.33)
Negative impact on behaviour	0-21	Invasive	3.57 (2.36 to 4.78)	2.27 (1.04 to 3.49)	0.93 (-0.27 to 2.13)	1.08 (-0.12 to 2.27)	0.31 (-0.41 to 1.04)	-0.40 (-1.93 to 1.14)	-2.43 (-3.96 to -0.91)	-3.08 (-4.88 to -1.27)	-1.15 (-2.67 to 0.38)	-1.42 (-2.52 to -0.32)
		Non-invasive	3.67 (2.75 to 4.59)	1.49 (0.76 to 2.22)	0.66 (-0.14 to 1.45)	0.67 (-0.03 to 1.37)	0.91 (-0.18 to 1.99)	-0.29 (-1.61 to 1.02)	-3.21 (-4.37 to -2.06)	-3.35 (-4.93 to -1.77)	-1.56 (-2.71 to -0.41)	-0.83 (-2.18 to 0.53)
Negative impact on sleep	0-12	Invasive	2.70 (1.54 to 3.87)	1.82 (0.79 to 2.85)	0.37 (-0.35 to 1.1)	1.06 (-0.37 to 2.49)	0.42 (-0.37 to 1.22)	-0.21 (-1.58 to 1.15)	-1.35 (-2.63 to -0.08)	-2.67 (-4.06 to -1.28)	-0.96 (-2.63 to 0.71)	-1.09 (-2.08 to -0.11)
		Non-invasive	2.80 (2.14 to 3.46)	1.01 (0.45 to 1.57)	0.44 (-0.27 to 1.15)	0.54 (0.02 to 1.07)	0.90 (-0.05 to 1.85)	-0.12 (-1.09 to 0.86)	-2.16 (-3.09 to -1.23)	-2.60 (-3.93 to -1.26)	-1.47 (-2.41 to -0.53)	-0.62 (-1.72 to 0.49)
Breast examination	0-6	Invasive	1.74 (1.21 to 2.26)	0.69 (0.26 to 1.13)	0.55 (-0.02 to 1.11)	0.37 (-0.08 to 0.81)	0.34 (-0.18 to 0.86)	-0.01 (-0.65 to 0.64)	-0.62 (-1.15 to -0.10)	-0.62 (-1.39 to 0.14)	-0.59 (-1.15 to -0.04)	-0.32 (-0.92 to 0.29)
		Non-invasive	1.64 (1.27 to 2.01)	0.73 (0.39 to 1.07)	0.52 (0.17 to 0.88)	0.40 (0.06 to 0.74)	0.40 (0.04 to 0.77)	-0.1 (-0.63 to 0.42)	-0.58 (-1.04 to -0.13)	-0.64 (-1.26 to -0.02)	-0.56 (-1.05 to -0.08)	-0.26 (-0.74 to 0.22)
Negative impact on sexuality	0-6	Invasive	1.17 (0.29 to 2.05)	0.62 (0.12 to 1.12)	0.12 (-0.51 to 0.76)	0.08 (-0.26 to 0.42)	0.18 (-0.22 to 0.58)	0.11 (-0.98 to 1.20)	-1.54 (-2.32 to -0.77)	-1.68 (-2.66 to -0.69)	-1.21 (-1.87 to -0.55)	-0.86 (-1.5 to -0.22)
		Non-invasive	0.67 (0.24 to 1.11)	0.49 (0.16 to 0.81)	0.28 (-0.30 to 0.87)	0.08 (-0.21 to 0.37)	0.39 (-0.20 to 0.98)	-0.39 (-1.14 to 0.36)	-1.68 (-2.36 to -1.00)	-1.52 (-2.39 to -0.64)	-1.21 (-1.85 to -0.57)	-0.65 (-1.43 to 0.12)
Felt less attractive	0-3	Invasive	0.12 (0.00 to 0.24)	0.10 (-0.03 to 0.22)	0.12 (-0.16 to 0.40)	0.20 (-0.09 to 0.50)	0.08 (-0.09 to 0.26)	-0.05 (-0.22 to 0.12)	-0.25 (-0.44 to -0.05)	-0.36 (-0.71 to -0.02)	-0.27 (-0.64 to 0.11)	-0.21 (-0.44 to 0.02)
		Non-invasive	0.18 (0.06 to 0.31)	0.09 (0.00 to 0.18)	0.03 (-0.06 to 0.13)	0.08 (-0.05 to 0.21)	0.05 (-0.03 to 0.13)	0.01 (-0.16 to 0.18)	-0.26 (-0.43 to -0.08)	-0.45 (-0.68 to -0.22)	-0.39 (-0.68 to -0.1)	-0.24 (-0.41 to -0.07)
Keeping mind of things	0-3	Invasive	1.24 (0.90 to 1.57)	0.55 (0.26 to 0.84)	0.12 (-0.13 to 0.36)	0.34 (-0.02 to 0.70)	0.11 (-0.07 to 0.30)	0.06 (-0.33 to 0.46)	-0.58 (-0.94 to -0.22)	-0.78 (-1.19 to -0.37)	-0.10 (-0.53 to 0.32)	-0.42 (-0.69 to -0.15)
		Non-invasive	1.05 (0.84 to 1.27)	0.39 (0.21 to 0.57)	0.23 (-0.02 to 0.47)	0.21 (0.05 to 0.37)	0.17 (-0.01 to 0.36)	-0.12 (-0.42 to 0.17)	-0.75 (-1.02 to -0.47)	-0.67 (-1.08 to -0.27)	-0.23 (-0.49 to 0.03)	-0.36 (-0.63 to -0.09)
Worries about breast cancer	0-4	Invasive		0.86 (0.47 to 1.25)	0.74 (0.19 to 1.29)	0.23 (-0.22 to 0.69)	0.23 (-0.17 to 0.64)					
		Non-invasive		0.56 (0.28 to 0.83)	0.67 (0.23 to 1.11)	0.20 (-0.08 to 0.47)	0.05 (-0.22 to 0.32)					
Inner calm	0-4	Invasive		0.69 (0.33 to 1.05)	0.30 (-0.15 to 0.75)	0.30 (-0.14 to 0.75)	0.01 (-0.31 to 0.33)		-0.13 (-0.56 to 0.30)	-0.29 (-0.76 to 0.19)	-0.20 (-0.71 to 0.31)	-0.41 (-0.84 to 0.03)
		Non-invasive		0.62 (0.36 to 0.89)	0.54 (0.10 to 0.98)	0.09 (-0.19 to 0.36)	0.02 (-0.26 to 0.30)		-0.20 (-0.55 to 0.16)	-0.05 (-0.54 to 0.44)	-0.42 (-0.79 to -0.04)	-0.40 (-0.80 to 0.01)
Social network	0-6	Invasive		0.65 (0.27 to 1.03)	0.41 (-0.16 to 0.98)	0.42 (0.03 to 0.82)	0.34 (-0.07 to 0.74)		-0.76 (-1.26 to -0.25)	-0.45 (-1.05 to 0.15)	-0.62 (-1.13 to -0.11)	-0.35 (-0.86 to 0.16)
		Non-invasive		0.32 (0.08 to 0.57)	0.39 (-0.04 to 0.82)	0.22 (-0.06 to 0.50)	0.15 (-0.07 to 0.37)		-1.08 (-1.50 to -0.67)	-0.47 (-0.97 to 0.03)	-0.83 (-1.26 to -0.39)	-0.54 (-0.91 to -0.16)
Existential values	0-12	Invasive		2.96 (1.94 to 3.99)	2.19 (0.88 to 3.49)	1.79 (0.68 to 2.90)	0.43 (-0.36 to 1.23)		-0.22 (-1.44 to 1.01)	-0.83 (-2.32 to 0.67)	-1.07 (-2.39 to 0.26)	-2.00 (-3.12 to -0.88)
		Non-invasive		2.27 (1.61 to 2.94)	1.70 (0.76 to 2.64)	1.44 (0.67 to 2.21)	0.91 (0.20 to 1.62)		-0.91 (-1.85 to 0.03)	-1.31 (-2.56 to -0.05)	-1.41 (-2.47 to -0.35)	-1.53 (-2.59 to -0.47)