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EUROPEAN JOURNAL OF CANCER

Who gets screened, and where: A comparison of organised and opportunistic mammography screening in Geneva, Switzerland ☆

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ARTICLE INFO

ABSTRACT

It is unclear whether introducing organised mammography screening programmes in a population where opportunistic screening is prevalent results in the two types of screening mainly competing against each other or attracting different groups of women. To compare women who participate in organised screening and those who prefer opportunistic screening, we conducted a prospective study of 932 women followed for 8 months after an invitation to participate in the first round of an organised screening programme in Geneva, Switzerland. All women were aged 50–69 years and were due for a mammogram according to local guideline. Of the 932 participants, 11.6% had an organised and 39.4% an opportunistic mammogram during follow-up. Women who were in the stage of contemplation, had favourable attitude toward mammography screening, and perceived their risk of breast cancer to be high were more likely to have a mammogram (either organised or opportunistic). Compared to women who had an opportunistic mammogram, women with an organised mammogram were less positive about screening, less likely to be in maintenance at baseline (adjusted odds ratio (OR), 3.0; 95% confidence interval (CI), 1.7–5.5), to have a history of benign breast disease (OR, 2.4; 95% CI, 1.2–5.1) and to perceive their financial situation as comfortable (OR, 1.7; 95% CI, 1.1–2.8). Although screening uptake was low, the programme appeared to attract women in lower socio-economic strata who did not usually undergo mammography screening.

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1.   Introduction

To maximise mammography screening effectiveness, ensure that women obtain high quality screening and facilitate the evaluation of screening impact on mortality, organised programmes aim to reach high levels of participation in the target population.[1,2] In Switzerland and other liberal healthcare systems, screening programmes managers face the challenge of pursuing high-participation goals despite substantial background rates of opportunistic screening.[3–5] Surprisingly, little is known about the relationship between the availability of opportunistic screening and attendance in organised breast cancer screening. It is particularly unclear whether organised and opportunistic screening respond to the needs of different segments of the population or attract the same women, thereby competing against each other.

In Geneva, the proportion of women aged 50–69 years old using opportunistic mammography increased from 38% in 1995 to near 70% in 2000.[6,7] That year, we launched a cohort study to describe psycho-social determinants of mammography screening in the first round of women invited to the organised programme. A goal of the follow-up study was to determine whether an organised screening programme introduced in this context of prevalent opportunistic screening would attract women not accustomed to screening, and/or entice women to switch from opportunistic to organised screening. Specifically, the aims were to (1) describe the characteristics of women who had any mammogram (organised or opportunistic) during follow-up; (2) compare the profiles of women who had each type of mammogram.

2.   Materials and methods

2.1.   Setting and context

The Geneva mammography screening programme proposes biennial two-view mammograms with independent double reading to all residing women aged 50–69 years old, regardless of their history of screening or diagnostic mammogram(s) more than two years in the past (the only criteria of ineligibility are a history of recent mammogram, breast cancer, or high familial risk of breast cancer).

Identification of potentially eligible women is based on population updates obtained from the Geneva population register. Women receive an information leaflet by mail, and one month later, an invitation letter. The leaflet describes mammography screening, announces the coming invitation and indicates how to obtain a self-initiated screening mammogram at any time by contacting the Foundation directly. The letter of invitation provides instructions about obtaining an appointment with an accredited radiologist, but does not propose a specific date. A second invitation is sent within two months to women who did not respond to the first mailing.

To be accredited by the programme, local radiologists must provide screening services at a lower fee and of a quality modelled after European Guidelines for Quality Assurance in Mammography Screening.[8] In 2000, 13 mammography providers (12 private and 1 public) were accredited by the Geneva programme.

2.2.   Study population and survey design

The study population included 4000 women aged 50–69 years selected for a first invitation in September 2000. The baseline study questionnaire was mailed to women in June 2000, using the personal information provided by the programme. A reminder card and up to three additional mailings were sent to non-respondents over the summer. A similar procedure was followed in 2001 for the follow-up survey (initial mailing in May, last mailing in September 2001). For each woman, study follow-up started 10 days after the programme leaflet was mailed (to account for time to receive the document and minimum delay to obtain a mammogram) and ended 1 day before the date on the response envelope. The study protocol was approved by the Geneva Review Board. All women were informed that their participation was strictly voluntary and that they had the right to refuse to respond without risking any penalty.

2.3.   Dependent variable

The follow-up questionnaire asked whether the respondent had had a screening mammogram since September 2000, and, if yes, how the radiologist's appointment was made (doctor *versus* programme procedure) and when the exam took place. Women's attendance in the screening programme was taken from the programme's registry (*organised mammogram*). A woman was considered having had an *opportunistic mammogram* during follow-up if (1) she reported having had a *screening* mammogram during follow-up and (2) the screening registry did not mention an organised mammogram. Among women retained for the study ($n = 932$), rates of agreement between self reports and registry data were 95.7% for 'having had an organised mammogram during follow-up' ($n = 92$) and 99.0% for 'not having had mammogram during follow-up' ($n = 382$).

2.4.   Independent variables

Our study was guided by the transtheoretical model (TTM) – a behavioural framework that conceives the adoption of a new behaviour as a process involving progress through a series of stages.[9] Initially developed to inform programmes of smoking cessation, the TTM has been successfully applied to research on a number of behavioural changes[10] including the adoption of regular mammography utilisation.[11] We collected information on about 40 potential determinants of mammography screening behaviour, including stages of adoption of mammography screening as defined by Rakowski *et al.*[12] Preliminary analysis indicated that only the following variables might be independently associated with the outcomes of interest.

(a) *Stage of adoption of mammography screening*: Number of screening mammograms in the past 4 years, date of last mammogram, and intention to have mammograms in the future were used to identify women's baseline stages of adoption of mammography screening.[12,13] The following stages were considered: (1) Precontemplation: no past mammogram, no intention to have

one within 6 months. (2) Contemplation: no mammogram in the past 2 years, intention to have one within 6 months. (3) Action: one mammogram in past 2 years, none 2–4 years ago, intention to have one in the future. (4) Maintenance: one mammogram in the past 2 years, at least another 2–4 years ago, intention to have one in the future. (5) Relapse risk: one mammogram in the past 2 years or two mammograms on-schedule in the last 4 years, but no intention to have one in the future. (6) Relapse: one or more mammograms in the past, none in the past 2 years, no intention to have one within 6 months.

(b) *Knowledge of mammography screening*: Items about recommended frequency for screening mammograms in Geneva ('once every year', 'every two years', 'every 4 years', 'no recommendation', 'do not know') and proportion of breast cancer deaths that regular screening prevents in women above 50 ('no death', 'about one-fourth of deaths', 'one-half', 'three-fourths', 'all', 'do not know'; women reporting 'one half' or more were considered overestimating screening efficacy).

(c) *Attitudes toward mammography screening* were assessed with Rakowski's scales of favourable (pros) and unfavourable (cons) attitudes toward mammography screening.[14] For statistical analyses, raw scores were transformed into *T*-scores (mean = 50, standard deviation = 10) and Rakowski's decisional balance index was calculated by subtracting the *T*-score of cons from the *T*-score of pros.

We also included questions about women's preference for doctor's role in mammography screening decisions,[15] objective and subjective risk of breast cancer (familial history of breast cancer, personal history of benign breast diseases and breast biopsy, and perceived risk compared to women in the same age group), visits to a general practitioner and a gynaecologist in the past year, and socio-demographic data.

2.5. Statistical analysis

Analyses were restricted to women due for a mammogram (i.e. no mammogram in the past 2 years or, for women in action or maintenance at baseline, next mammogram due before the end of the period of follow-up). To reflect the likely decision making process of women ('do I want to have a mammogram?'; 'If yes, how should I obtain it?'), we first studied the associations between women's characteristics and mammography screening during follow-up; then, excluding women with no follow-up mammogram, we examined the associations between women's characteristics and having had an organised *versus* opportunistic mammogram. Contingency tables and χ^2 tests were used to assess bivariate relationships between independent variables and outcomes. Separate logistic regression analyses were run to identify independent predictors of each outcome (mammography use and attendance to organised screening). All variables predicting an outcome of interest in bivariate analysis at $P = 0.20$ were initially entered in the corresponding multivariate model. A backward strategy was used to eliminate covariates that

did not significantly contribute to at least one model. All tests were two-tailed with alpha at 0.05.

3. Results

3.1. Sample characteristics

We excluded women whose name was not on the programme final mailing list (88), had moved out of the canton (149), did not speak French (65), were too sick to respond or had died (50; Fig. 1). We further excluded 90 respondents who had a personal history of breast cancer. Of the remaining 3558 women, 1300 did not respond to the initial survey and 14 erased their ID number. Of the 2244 respondents to the baseline survey, 1419 were eligible for mammogram, and 825 did not need a mammogram until the end of the study period. Of the former, 932 completed the follow-up questionnaire and 487 were lost to the study (17 moved away, 12 were too ill or diseased, 458 did not respond to survey).

At baseline, just prior to their first programme invitation, most of the 2244 respondents to the baseline survey had a history of prior opportunistic mammogram (90.8%), intended to have one in the future (86.7%), knew the recommended frequency for screening (68.5%), overestimated screening efficacy (55.4%) and had seen a gynaecologist in the past year (80.9%).

The baseline characteristics of the 932 women included in the main analyses are presented in Table 1 (data column 1).

3.2. Mammography screening during follow-up

In bivariate analysis, women with a mammogram during follow-up were significantly more likely to be in contemplation (reference category: maintenance), to have a favourable attitude to screening (higher scores on pros and lower on cons), to believe that screening mammograms are recommended at least once every 4 years, to overestimate mammography efficacy, to have a higher subjective risk of breast cancer, and to consider that their doctor has the primary responsibility for making decisions about mammography (Table 1, data columns 1–3).

3.3. Bivariate correlates of organised mammography among women who had a mammogram

Women who had an *organised* (*versus* opportunistic) mammogram during follow-up were especially likely to be in precontemplation, relapse risk, or relapse at baseline, and significantly less likely to be in maintenance (Table 1, data columns 4–6). They tended to have less favourable attitudes toward mammography screening (high cons), were less likely to have histories of benign breast disease or breast biopsy, to have visited a gynaecologist or a general practitioner recently and more likely to perceive their financial situation as difficult.

3.4. Multivariate analyses

In multivariate logistic regression, being in contemplation, having a more positive attitude toward screening, and having

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┌─────────────────────────────────┐
│ Residing women aged 50-69 years │
│ listed for invitation to        │
│ screening in Sept. 2000         │
│ n=4000                          │
└─────────────────────────────────┘
                 │
                 ├──────────────────▶  ┌──────────────────────────────────┐
                 │                      │ Excluded n=354                   │
                 ▼                      │   Personal history of breast     │
┌─────────────────────────────────┐    │   cancer n=90                    │
│ Eligible for baseline survey    │    │   Moved away n=149               │
│ (June 25, 2000)                 │    │   Did not speak French n=65      │
│ n=3646                          │    │   Too ill or deceased n=50       │
└─────────────────────────────────┘    └──────────────────────────────────┘
                 │
                 ├──────────────────▶  ┌──────────────────────────────────┐
                 │                      │ Not on program's final list for  │
                 ▼                      │ mailing of information leaflet    │
┌─────────────────────────────────┐    │ n=88                             │
│ On final list for September      │    └──────────────────────────────────┘
│ 1-18, 2000 mailing of           │
│ information leaflet              │
│ n=3558                          │
└─────────────────────────────────┘
                 │
                 ├──────────────────▶  ┌──────────────────────────────────┐
                 │                      │ Not available for next study     │
                 ▼                      │ phase n=1314 *                   │
┌─────────────────────────────────┐    │   Did not respond to survey      │
│ Respondent to baseline survey;  │    │   n=1300                         │
│ available for follow-up         │    │   Responded but erased ID        │
│ n=2244*                         │    │   number n=14                    │
└─────────────────────────────────┘    └──────────────────────────────────┘
                 │
                 ├──────────────────▶  ┌──────────────────────────────────┐
                 │                      │ Local guideline did not          │
                 ▼                      │ recommend mammography until end  │
┌─────────────────────────────────┐    │ of follow-up n=825               │
│ Eligible for screening          │    └──────────────────────────────────┘
│ mammogram                       │
│ n=1419                          │
└─────────────────────────────────┘
                 │
                 ├──────────────────▶  ┌──────────────────────────────────┐
                 │                      │ Losses to follow-up n=487        │
                 ▼                      │   Did not respond to survey      │
┌─────────────────────────────────┐    │   n=458 **                       │
│ Follow-up completed             │    │   Moved away n=17                │
│ n=932**                         │    │   Too ill or deceased n=12       │
└─────────────────────────────────┘    └──────────────────────────────────┘
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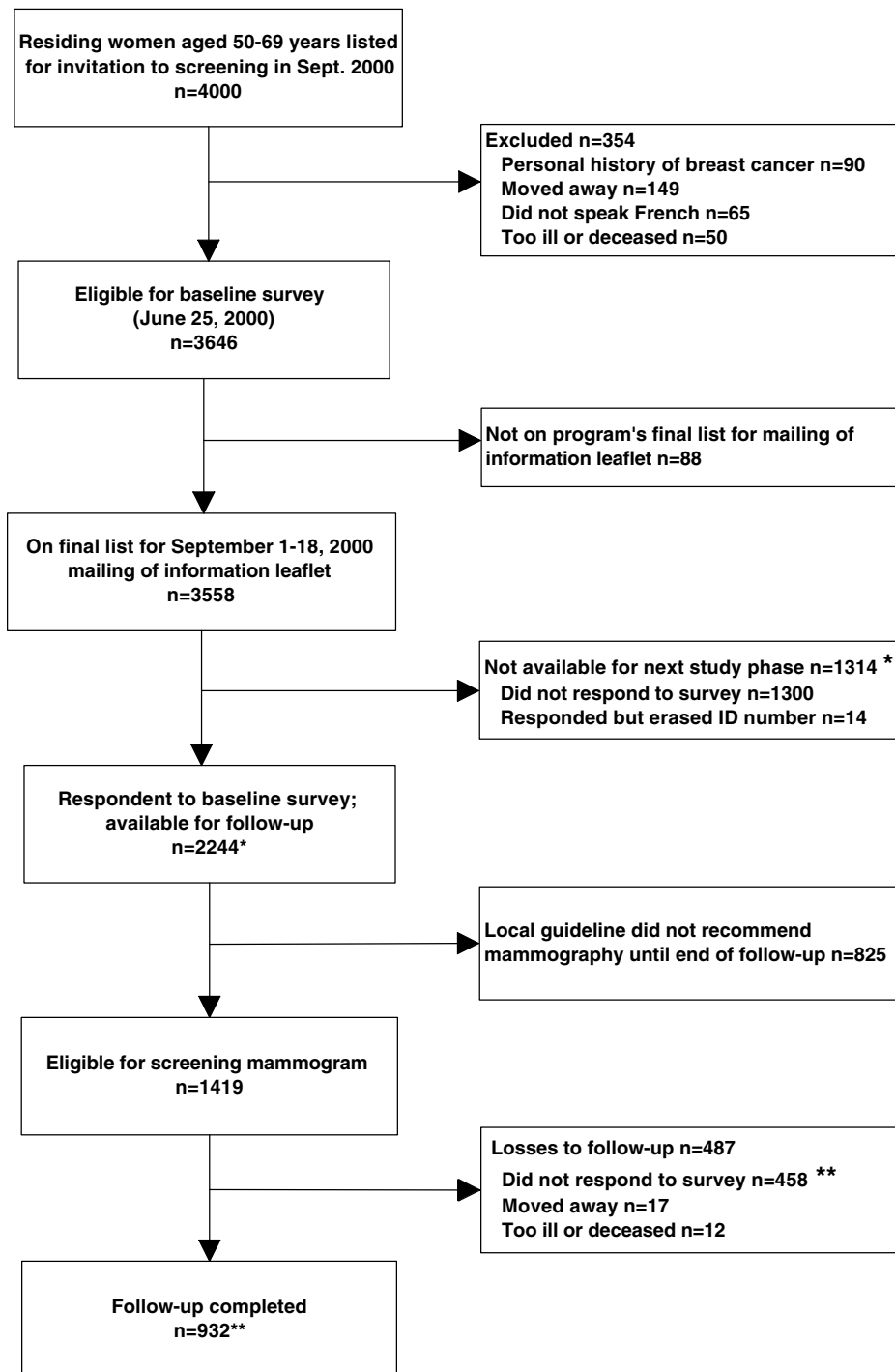
Fig. 1 – Description of mammography screening programme cohort, Geneva, Switzerland (September 2000–2001). *In a multiple logistic regression model, compared with the 1314 non-respondents to the baseline survey (respondents who erased their identification number were assimilated to non-respondents), the 2244 respondents were more likely to be of ages 50–59 years (regression-adjusted odds ratio [aOR], 1.2; 95% CI, 1.1–1.4; P = 0.01), married (aOR, 1.3; 95% CI, 1.1–1.5; P < 0.001), and Swiss (aOR, 2.3; 95% CI, 2.0–2.7; P < 0.001). Of the respondents, 7.0% (95% CI, 5.7–8.4) eventually obtained a programme mammogram *versus* 4.3% (95% CI, 3.2–5.5) of the non-respondents P = 0.02. **In a multiple logistic regression model, compared with the 458 non-respondents to the follow-up survey, the 932 respondents were more likely to be married (aOR, 1.3; 95% CI, 1.0–1.7; P = 0.03), Swiss (aOR, 1.5; 95% CI, 1.1–2.0; P = 0.03), have more than 10 years of education (aOR, 1.6; 95% CI, 1.2–2.2; P = 0.002), and share or delegate mammography decisions to their doctor (aOR, 2.3; 95% CI, 1.5–3.6; P < 0.001); 11.6% (95% CI, 9.6–13.8) of women who completed the follow-up questionnaire had a programme mammogram compared to 2.2% (95% CI, 1.1–4.0) of women who did not respond to the questionnaire (P < 0.001).

Table 1 – Rate (percentage), univariate odds ratio (OR), and confidence interval (CI) for having a mammogram (organised or opportunistic versus none) and having an organised (versus opportunistic) mammogram during follow-up, by personal characteristics, among women who were eligible for a mammogram according to screening recommendations, and completed both the baseline and follow-up surveys

Characteristic	932 eligible women (column %)	Had a mammogram (versus none) %	OR (95% CI)	475 eligible women who had a mammogramm (column %)	Had an organised mammogram (versus opportunistic)%	OR (95% CI)
Stage of adoption of mammography screening						
Maintenance	325 (37.6)	53.8	1.0[a]	175 (38.6)	10.3	1.0[a]
Precontemplation	85 (9.8)	42.4	0.63 (0.39, 1.0)[b]	36 (7.9)	38.9	5.6 (2.4, 12.7)[b]
Contemplation	156 (18.0)	63.5	1.5 (1.0, 2.2)	99 (21.9)	26.3	3.1 (1.6, 6.0)[b]
Action	164 (19.0)	51.2	0.90 (0.62, 13)	84 (18.5)	27.4	3.3 (1.7, 6.5)[b]
Relapse risk	29 (3.4)	41.4	0.61 (0.28, 13)	12 (2.6)	41.7	6.2 (1.8, 21.7)[b]
Relapse	106 (12.3)	44.3	0.68 (0.44, 1.1)	47 (10.4)	38.3	5.4 (2.5, 11.6)[b]
Pros (approximate tertiles)						
Lowest	393 (43.6)	46.1	1.0[a]	181 (39.1)	25.4	1.3 (0.79, 2.1)
Middle	187 (20.7)	53.5	1.4 (0.95, 1.9)	100 (21.6)	20.0	0.95 (0.52, 1.7)
Highest	322 (35.7)	56.5	1.5 (1.1, 2.1)[b]	182 (39.3)	20.9	1.0[a]
Cons (approximate tertiles)						
Lowest	337 (37.5)	57.0	1.7 (1.2, 2.4)[b]	192 (41.6)	17.2	1.0[a]
Middle	325 (36.2)	50.8	1.3 (0.94, 1.8)	165 (35.8)	18.8	1.1 (0.65, 1.9)
Highest	236 (26.3)	44.1	1.0[a]	104 (22.6)	37.5	2.9 (1.7, 5.0)[b]
Screening recommended						
No recommendation/no opinion	89 (9.6)	33.7	1.0[a]	30 (6.4)	33.3	1.4 (0.56, 3.5)
Every 4 years	54 (5.8)	64.8	3.5 (1.7, 7.0)	35 (7.4)	31.4	1.3 (0.53, 3.1)
Every 2 years	640 (69.1)	52.8	2.1 (1.3, 3.3)	338 (71.6)	20.1	0.70 (0.39, 1.3)
Every year	143 (15.5)	48.3	1.8 (1.0, 3.0)	69 (14.6)	27.5	1.0[a]
Overestimates screening efficacy to prevent deaths						
No	423 (46.0)	45.2	1.0[a]	191 (40.6)	22.0	1.0[a]
Yes	496 (54.0)	56.3	1.6 (1.2, 2.0) [b]	279 (59.4)	23.7	1.1 (0.71, 1.7)
Subjective risk of breast cancer compared to peers						
Lower	162 (17.8)	43.8	1.0[a]	71 (15.2)	31.0	4.3 (1.2, 15.8)[b]
Similar	482 (53.0)	53.1	1.5 (1.0, 2.1)[b]	256 (54.7)	22.3	2.8 (0.81, 9.4)
Higher	50 (5.5)	64.0	2.3 (1.2, 4.4)[b]	32 (6.8)	9.4	1.0[a]
No opinion	216 (23.7)	50.5	1.3 (0.87, 2.0)	109 (23.3)	22.9	2.9 (0.81, 10.2)
History of benign breast disease						
No	709 (78.0)	50.6	1.0[a]	359 (77.2)	27.0	3.6 (1.8, 7.1)[b]
Yes	200 (22.0)	53.0	1.1 (0.80, 1.5)	106 (22.8)	9.4	1.0[a]
History of surgical breast biopsy						
No	840 (90.8)	51.3	1.2 (0.77, 1.9)	431 (91.5)	24.1	2.9 (1.0, 8.3)[b]
Yes	85 (9.2)	47.1	1.0[a]	40 (8.5)	10.0	1.0[a]
Visited a gynaecologist in the past year						
No	257 (28.0)	47.9	1.0[a]	123 (26.3)	30.1	1.7 (1.1, 2.7)[b]
Yes	662 (72.0)	52.0	1.2 (0.88, 1.6)	344 (73.7)	20.1	1.0[a]
Visited a generalist in the past year						
No	212 (23.2)	46.7	1.0[a]	99 (21.2)	31.3	1.7 (1.1, 2.7)[b]
Yes	702 (76.8)	52.3	1.3 (0.92, 1.7)	367 (78.8)	20.4	1.0[a]
Mammography screening						
Primarily the woman's decision	52 (5.7)	38.5	1.0[a]	20 (4.3)	23.1	1.4 (0.52, 3.9)
Shared	394 (43.3)	49.5	1.6 (0.87, 2.8)	195 (41.8)	21.5	1.0[a]
Primarily the doctor's decision	463 (50.9)	54.2	1.9 (1.1, 3.4)[b]	251 (53.9)	30.0	1.6 (0.57, 4.3)
Age						
50–59 years	572 (61.4)	50.7	1.0[a]	290 (61.1)	23.1	1.1 (0.68, 1.6)
60–69 years	360 (38.6)	51.4	1.0 (0.79, 1.3)	185 (38.9)	22.2	1.0[a]

Table 1 – continued

Characteristic	932 eligible women (column %)	Had a mammogram (*versus* none) %	OR (95% CI)	475 eligible women who had a mammogramm (column %)	Had an organised mammogram (*versus* opportunistic)%	OR (95% CI)
Married						
No	315 (33.9)	47.6	1.0[a]	150 (31.7)	22.7	1.0[a]
Yes	613 (66.1)	52.7	1.2 (0.93, 1.6)	323 (68.3)	22.9	1.0 (0.44, 1.6)
Swiss						
No	173 (18.6)	46.8	1.0[a]	81 (17.1)	19.8	1.0[a]
Yes	755 (81.4)	51.9	1.2 (0.88, 1.7)	392 (82.9)	23.5	1.2 (0.69, 2.3)
Personal financial situation perceived as difficult						
No	481 (54.4)	52.0	1.1 (0.83, 1.4)	250 (55.7)	17.6	1.0[a]
Yes	404 (45.6)	49.3	1.0[a]	199 (44.3)	28.6	1.9 (1.2, 2.9)[b]
Level of education						
⩽10 years	176 (20.5)	48.3	1.0[a]	357 (80.8)	31.8	1.7 (0.99, 2.8)
>10 years	683 (79.5)	52.3	1.2 (0.84, 1.6)	85 (19.2)	21.8	1.0[a]

a The reference category is indicated by an OR of 1.0.
b Statistically significant.

Table 2 – Multivariable logistic regression analysis for characteristics independently associated with women having had a screening mammogram (organised or opportunistic) during follow-up

	Had- *versus* did not have a screening mammogram (n = 932)[a]		
	OR[b]	95% CI	P value
Stage of adoption of mammography screening			
Maintenance	1.0[c]		
Precontemplation	0.93	(0.52, 1.7)	<0.001[d]
Contemplation	1.7	(1.1, 2.5)	
Action	0.95	(0.65, 1.4)	
Relapse stages (relapse risk or relapse)	0.86	(0.55, 1.4)	
Decisional balance (*T*-score), 10-unit increase	1.2	(1.1, 1.3)	0.001
Subjective risk of breast cancer compared to other women			
Lower	1.0[c]		
Similar	1.2	(0.82, 1.8)	0.002[d]
Higher	1.8	(0.89, 3.6)	
No opinion	1.3	(0.87, 2.1)	

up questionnaires.
b aOR, adjusted odds ratio; 95% CI, 95% confidence interval.
c The reference category is indicated by an OR of 1.0.
d Likelihood ratio test.

a higher subjective risk of breast cancer were independently associated with attendance to screening mammography during follow-up (Table 2).

In contrast, not being in the stage of maintenance, having no history of benign breast disease, having a more negative attitude toward screening, and perceiving their personal financial situation as difficult independently predicted having an *organised* mammogram among women who had a screening mammogram during follow-up (Table 3).

4.   Discussion

In this study of women due for a screening mammogram, only half of the participants had a mammogram (organised or opportunistic) – and only 11.6% had an organised mammogram – within 8 months of receiving the information leaflet of the Geneva screening programme. This suggests that the programme does not recruit women as efficiently as hoped, though this was only the first round of the screening invitation.

At the current levels of participation, mammography screening in Geneva, opportunistic and organised combined, is believed to prevent the death of 10–15 women each year.[16] There is therefore an urgent need to assess and compare the cost-effectiveness of the two forms of screening, in particular with regard to the longer term. Organised screening theoretically offers advantages, in particular at the population level, whereas opportunistic screening seems to be preferred by many women. Since the benefits and costs of each form of

Table 3 – Multivariable logistic regression analysis for characteristics independently associated with women having had an organised- versus an opportunistic mammogram during follow-up

	Had an organised- *versus* an opportunistic mammogram ($n = 475$)[a]		
	OR[b]	95% CI	P value
Stage of adoption of mammography screening			
Maintenance	1.0[c]		<0.001[d]
Precontemplation	3.2	(1.2, 8.6)	
Contemplation	2.7	(1.3, 5.5)	
Action	2.6	(1.3, 5.4)	
Relapse stages (relapse risk or relapse)	5.0	(2.3, 11.0)	
Decisional balance (*T*-score), 10-unit increase	0.85	(0.72, 1.0)	0.05
History of benign breast disease			
No	2.4	(1.2, 5.1)	0.05
Yes	1.0[c]		
Personal financial situation perceived as difficult			
No	1.0[c]		
Yes	1.7	(1.1, 2.8)	0.03

a Analysis included 475 women eligible for a mammogram according to screening recommendations, who had a mammogram (organised or opportunistic) during follow-up, and completed both baseline and follow-up questionnaires.
b OR, odds ratio; 95% CI, 95% confidence interval.
c The reference category is indicated by an OR of 1.0.
d Likelihood ratio test.

screening are linked to different factors, the decision to maintain both forms of screening or to give preference to one form over the other will ultimately be political.

The difficulty of introducing organised screening into a liberal health care environment has long been recognised.[2,3,5,17] Although there is little empirical evidence about conditions for success, critical elements cited are a clear political commitment toward organised screening, compatibility of programme operations with local structure of health care delivery, effective partnership with the medical community, and continuous education of the public about the benefits and ambiguities of breast cancer screening.

Among organised programmes, rates of attendance at the first round of screening have varied considerably. The highest participation rates (above 75%) have generally been observed in North-European countries[18–21] and in programmes that provided women with fixed appointments to a radiological facility.[22] Lower attendance rates (20–60%) have been more common in other regions of the world, and in open-invitation or non-invitational programmes.[23–30] It is possible that mammography uptake would increase in Geneva if the programme provided women with fixed appointments.

4.1. Characteristics of women who had a mammogram

Women who had a mammogram at follow-up were more likely to assess their risk of breast cancer as higher than average at baseline, had favourable attitudes toward mammography screening, overestimated the efficacy of mammography screening, considered attending mammography screening for the first time, and believed that the decision to undergo screening rests primarily with the doctor. In a previous study of opportunistic screening in Geneva, on-schedule mammography was strongly associated with recent visit to a gynaecologist, gynaecologist's recommendation for mammography

and a positive attitude toward mammography screening.[31] Here, there was no effect of having seen a gynaecologist, which might indicate that the programme was efficient in increasing awareness and that there is an evolution in women's attitude toward mammography screening.

4.2. Profiles of women who had an organised versus opportunistic mammogram

During follow-up, for each woman who obtained an organised mammogram three women had an opportunistic mammogram. While we may not assess whether the invitation to organised screening increased opportunistic screening uptake, the programme made steps in achieving its goals of increasing screening coverage and providing more equitable access to mammography. On average, women who chose organised screening were facing a more challenging financial situation than women who obtained an opportunistic mammogram; they had less experience with screening, less favourable attitudes toward it, less contacts with a gynaecologist or general practitioner, and tended to underestimate or ignore screening efficacy. These women were more likely to have never been screened, or to be at risk of abandoning screening. These results support the notion that organised programmes of cancer screening assure a better coverage of hard-to-reach populations.[32] They also expand upon previous findings that participants to organised screening have more trust in public health services than women who opt for opportunistic mammograms,[23] are of lower socioeconomic status,[23,33] and perceive their risk of breast cancer[13] and efficacy at preventing cancer[33] as lower. In studies conducted in Geneva before launching the screening programme, low-income women were also less likely to be in an advanced stage of adoption of opportunistic screening,[12,13] had less positive opinions about mammography, and lower odds of visiting a gynaecolo-

gist and receiving from him/her a recommendation for mammography screening (four characteristics that strongly predicted the use of opportunistic screening).[31] In a Finnish study,[33] women who did not participate in a first round of invitational screening belonged to either of the two groups: (1) women who had an opportunistic mammogram, a good financial situation, felt responsible for their health and overestimated their risk of breast cancer; (2) women who had no opportunistic mammogram, were less compliant with health recommendations, more socially isolated, depressed, and of lower income. It is likely that the Geneva screening programme primarily appealed to the second group of women.

In Switzerland, opportunistic mammograms are not covered by insurance health plans if done for screening as opposed to diagnostic purposes. Organised mammograms were initially reimbursed only beyond women's yearly deductible limits, but fees became fully reimbursed by January 2001, in the middle of our follow-up period. In the US, having a health insurance covering the costs of mammography screening is a strong predictor of screening use.[34] In several studies, even modest costs were associated with lower screening uptakes.[20,35,36] Programme uptake may therefore increase in Geneva as a result of the full reimbursement of fees.

4.3. Study strengths and limitations

By combining data from population-based registers and surveys, this prospective study explicitly accounted for patterns of non-attendance due to routine mammography obtained outside the programme. Moreover, having collected data on predictors of screening before women were invited ensured that women's response to programme invitation could not influence reporting of baseline attitudes and behaviours.

Our study however lacked a comparison group of women not invited for screening; therefore, we cannot rule out that women who had a mammogram during follow-up would have had a mammogram anyway had they not been invited for screening.

Women were provided with definitions of screening and diagnosis mammography, and instructed to report screening mammograms only. It is unclear whether they were able to accurately do so, however, since all eight study participants who reported breast symptoms when enrolling in the organised screening programme later also reported having had a screening mammogram.

Although quite typical of a mail-based cohort study,[18] response rates to our surveys were sub-optimal. Since analyses focused on women who responded to both the initial and follow-up surveys, our findings should not be generalised indiscriminately to the entire population. Nonetheless, since we used logistic regression with listwise deletion for multivariate analysis, non-responses are not likely to have substantially distorted relations between predictor and outcome variables.[37]

5. Conclusion

This prospective study showed that half of the women due for a mammogram had one on schedule, and that although screening uptake was low, the programme appeared to have improved access to mammography screening of the more disadvantaged women. Relations between opportunistic and organised screening remain poorly understood, yet are of great interest because similar issues are pending for colon and prostate cancer screening for instance. Further controlled studies are needed to clarify determinants of choice between opportunistic and organised screening.

Conflict of interest statement

The authors report no conflict of interest. The funding agreement with the Geneva Cancer League ensured the authors' independence in designing the study, interpreting the data, and writing and publishing papers.

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