

### Acta Oncologica



ISSN: 0284-186X (Print) 1651-226X (Online) Journal homepage: www.informahealthcare.com/journals/ ionc20

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Maria Kristiansen, Brian L. Thorsted, Allan Krasnik & My von Euler-Chelpin

To cite this article: Maria Kristiansen, Brian L. Thorsted, Allan Krasnik & My von Euler-Chelpin (2012) Participation in mammography screening among migrants and non-migrants in Denmark, Acta Oncologica, 51:1, 28-36, DOI: 10.3109/0284186X.2011.626447

To link to this article: https://doi.org/10.3109/0284186X.2011.626447



Published online: 30 Oct 2011.



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#### **ORIGINAL ARTICLE**

# Participation in mammography screening among migrants and non-migrants in Denmark

## MARIA KRISTIANSEN<sup>1</sup>, BRIAN L. THORSTED<sup>2</sup>, ALLAN KRASNIK<sup>1</sup> & MY VON EULER-CHELPIN<sup>2</sup>

<sup>1</sup>Danish Research Centre for Migration, Ethnicity, and Health (MESU), Health Services Research Unit, Department of Public Health, University of Copenhagen, Copenhagen K, Denmark and <sup>2</sup>Center for Epidemiology and Screening, Department of Public Health, University of Copenhagen, Copenhagen K, Denmark

#### Abstract

Background. Inequality in use of mammography screening across population groups is a concern since migrants are more likely to become non-users compared to the general population. The aim of this study was to a) identify determinants of participation among migrant groups and Danish-born women with emphasis on the effect of household size, socioeconomic position and use of healthcare services, and b) test whether effects of determinants were consistent across migrant and non-migrant groups. Material and methods. We used data from the first eight invitation rounds of the mammography screening programme in Copenhagen, Denmark (1991-2008) in combination with register-based data. Results. The crude odds ratio (OR) for not participating in mammography screening was 1.38 (95% CI, 1.30-1.46) for women born in other-Western and 1.80 (95% CI, 1.71-1.90) for women born in non-Western countries compared to Danish-born women. The adjusted OR was 1.14 (95% CI, 1.06-1.21) for other-Western and 1.19 (95% CI, 1.11-1.27) for women born in non-Western countries. Lack of contact with a general practitioner or dental services, and not being employed had a significant negative effect on use of mammography screening. Higher-educated women were significantly less likely to use mammography screening in all groups whilst hospitalisation had a significant effect among Danish-born women. Living alone was consistently associated with non-use of mammography screening. The probability of becoming a non-user was significantly less among women living within households of two to four persons compared to women living alone. Except in the case of age and hospitalisation, trends were similar across country of birth, but the relative importance of specific determinants in explaining use of mammography screening differed. Conclusion. Household size, socioeconomic position and use of healthcare services were determinants of participation in mammography screening. This study emphasises the need for conducting refined analyses distinguishing among subgroups within diverse populations when explaining differences in screening behaviour.

Breast cancer is the most common cancer in women worldwide [1]. In response to this, an increasing number of countries have implemented mammography screening programmes based on the intention to secure early diagnosis and reduce the overall mortality from breast cancer. According to European guidelines, mammography screening programmes should have a participation rate of at least 70% in order to perform at an acceptable level [2]. However, a significant segment of women do not participate in mammography screening causing concerns for the overall effect of such programmes. Inequality in uptake of mammography screening across population

groups is a further concern since studies have documented lower participation among various ethnic minority groups and migrants [3–5]. A review of 221 studies published between 1988 and 2007 found being a recent immigrant, being foreign-born and facing language barriers to be associated with nonuse of mammography screening [4]. A number of determinants of non-use among ethnic minority and migrant groups have been explored related to demographic, socioeconomic, and psychosocial factors. Studies have found low income, lack of health insurance, lack of knowledge, lack of recommendation from physicians, lack of trust, lack of transportation,

Correspondence: M. Kristiansen, Danish Research Centre for Migration, Ethnicity, and Health (MESU), Health Services Research Unit, Department of Public Health, University of Copenhagen, Øster Farimagsgade 5A, Building 10, 1014 Copenhagen K, Denmark. Tel: + 45 35 327961. Fax: + 45 35 327629. E-mail: makk@sund.ku.dk

pain and embarrassment, concerns for mammography safety, and language barriers to reduce the use of mammography screening programmes among ethnic minority and migrant groups [4,6–8].

A Danish study based on data from the mammography screening programmes in Copenhagen found migration to be associated with a higher relative risk of never use [3]. Besides migration, other important determinants of non-use were not using primary healthcare services (general practitioner or dental care) and not being married [3].

Social support has long been associated with health behaviours and health outcomes [9]. Social support provided by informal networks (relatives and friends) may influence use of mammography screening in three ways: 1) information support (help with translating and understanding the invitation for screening) may facilitate understanding and lessen mistrust and anxiety; 2) instrumental support (transportation) may overcome barriers related to geographical distance to screening site; and 3) emotional support may help women in the process of deciding whether to participate, when going to the clinic and when coping with waiting for the screening result. Differences in access to social support may be one reason for the lower use of mammography screening among ethnic minorities and migrant groups. Within quantitative research social support has been conceptualised in diverse ways ranging from marriage status, contact with family, friends and colleagues to church membership and organisational affiliations [10-13]. Existing literature show mixed results regarding the association between social support and participation in cancer screening. While some studies have found married adults to be more likely to participate in colorectal cancer screening, have a pap smear taken and participate in mammography screening, other studies have documented little or even negative impact of social roles such as marital status on the decision to utilise mammography screening [3,12–14]. Divergent results may partly be explained by study characteristics including differences in conceptualisation and measurement of social support, sample sizes and the extent of including other known determinants of use of mammography screening in analysis, e.g. socioeconomic position.

Use of healthcare services, such as contact with general practitioner and dentist may be associated with use of mammography screening since it may reflect an inclination to take various preventive and risk reducing measures. Unlike contact with general practitioner, use of dental services in Denmark requires co-payment and may therefore reflect not only knowledge and motivation for performing selfcare, but also varying socioeconomic resources in the study population. Hospitalisation reflects access to healthcare services which may be an indicator of knowledge of and trust in available services. However, since hospitalisation is furthermore clearly associated with morbidity, women hospitalised for longer periods of time may be less inclined to participate in mammography screening as a consequence of severe or prolonged morbidity [3].

We used individual data from the organised mammography screening programme in Copenhagen, Denmark, to explore: 1) the effects of determinants related to socioeconomic position, social support and use of healthcare services on participation in mammography screening among migrants from non-Western and other-Western countries compared to Danish-born women; and 2) whether effects of determinants were consistent across migrant and non-migrant groups.

#### Material and methods

In Copenhagen, Denmark, organised mammography screening is offered biennially to women aged 50-69 years. The programme started on 1 April 1991. The Danish Civil Registration System is used for identification of eligible women who receive a personal mailed invitation in Danish issued by the chief radiologist responsible for the programme. The invitation includes a fixed, changeable date of appointment. Two reminders are sent to non-responders. Screening takes place at specialised clinics at a hospital and are free of charge. We used data from the first eight invitation rounds of the Copenhagen programme which were implemented from April 1991 to April 2008. The second invitation round included women aged 50-71, but in subsequent rounds women above the age of 69 were not invited. Women in the agegroup 48-49 were invited in Round 8 but since this age-group is not part of the original target group for the screening programme no further emphasis will be given to results for this group of younger women. The programme has been described in more detail in a recent publication [15].

Individual data on invitation and participation were supplied by the screening programme, which subsequently were linked to the Danish Civil Registration System. This system includes data on date of birth, migration and death. Since the study population includes all women in the target group living in the Municipality of Copenhagen, a woman's inclusion in the study population is independent of her screening behaviour. Women were divided into two groups: users, defined as those women having participated in the organised mammography screening programme at least once; and non-users. Participation was used as the dependent variable, and independent variables consisted of country of birth, age, education, employment status, household size, use of primary healthcare services (general practitioner and dentist) and hospitalisation.

Statistics Denmark provided data on country of birth (exposure) which was divided into Danish; other-Western comprising the Nordic countries, countries within the European Union, Andorra, Liechtenstein, Monaco, San Marino, Switzerland, the Vatican City, Canada, the United States, Australia, and New Zealand; and non-Western including all other countries. Furthermore, age and current employment status were extracted. Employment status was dichotomised (yes/ no) according to employment status the year before the first invitation, and women who had taken early retirement or who were pensioners were classified as being not employed. In Denmark the retirement age is currently 65. This implies that a large part of women in the target group for the mammography screening programme are retired due to labour incentives or ill health. Level of education was determined based on data from Statistics Denmark using information from different registries on highest obtained education. For migrants, level of education was furthermore determined based on self-reported data and imputed values from biannual surveys among migrants. Education was classified into three levels: low which included lower and higher primary and vocational; medium defined as secretarial and sales, and high comprised of secondary/lower tertiary and academics. Unknown values were placed in the low education category. Household size was defined by the number of persons living at the same address. Data on use of primary healthcare services was provided by the Danish Health Insurance Registry including information on contacts with general practitioner (GP) and dental care. Data on public and private hospitalisation came from the National Patient Registry.

All independent variables refer to the year before first invitation except in the case of age, which refers to age in the year of first invitation. Data linkage was done by using the personal identification number assigned to all inhabitants in Denmark. Logistic regression was used to calculate odds ratios (OR) of non-use versus use of mammography screening in relation to exposure status. Confidence intervals (CI) were determined at a 95% level. Ratio of OR (ROR) was used to determine the significance of differences in effects of independent variables across country of birth [16]. Statistical analyses were performed using SAS 9.1 statistical package (SAS Institute, Cary, North Carolina, USA).

The order of the independent variables in the final model reflects the significance level for each variable. Thus, the final model contains the explanatory variables in order of decreasing significance.

#### Results

The number of Danish-born women included in the analysis was 84 489 and of these 74% were users of the organised mammography screening programme. In total, 5484 women born in other-Western countries were included and of these 67% had participated at least once, while the 5891 women born in non-Western countries had the lowest participation (61%) (Table I).

The crude odds ratio (OR) for non-use of mammography screening was 1.38 (95% CI, 1.30–1.46) for women born in other-Western and 1.80 (95% CI, 1.71–1.90) for women born in non-Western countries compared to Danish-born women. After adjusting for age, level of education, employment status, household size, use of primary healthcare services and hospitalisation there was still a significantly increased probability of becoming a non-user among migrant women with an OR of 1.14 (95% CI, 1.06–1.21) for other-Western and 1.19 (95% CI, 1.11–1.27) for women born in non-Western countries (Table II).

In the final model, the effect of explanatory variables in determining use of mammography screening in order of decreasing significance were; age, contact with dental services, employment status, contact with general practitioner, household size, education, and number of days hospitalised (Table II).

The probability of becoming a non-user of mammography screening was significantly associated with age among Danish-born women only with women aged 55–64 being the least likely to become non-users (Table III).

Women within the high-education group were consistently less likely to use mammography screening across all countries of birth with an adjusted OR for non-use among Danish-born women in the high-education group at 1.35 (95% CI, 1.25–1.46); 1.40 (95% CI, 1.11–1.76) among women born in other-Western countries, and 1.51 (95% CI, 1.17–1.95) among women born in non-Western countries compared to the low-education group, respectively (Table III).

Not being employed at the labour market significantly increased the probability of becoming a nonuser of mammography screening across all countries of birth. While Danish-born women not attached to the labour market had a 87% increase in probability of non-use compared to women employed at the labour market there was a less strong trend among women born in other-Western and non-Western countries with ORs of 1.71 (95% CI, 1.49–1.96) and 1.60 (95% CI, 1.41–1.82), respectively (Table III).

Living alone was consistently associated with less use of mammography screening across migrant and non-migrant groups with the probability of becoming a non-user being significantly less among women

Table I. Women included in the target groups for organised mammography screening in Copenhagen (1991–2008) according to country of birth and use/non-use of screening, age, education, employment, household size, contact with general practitioner (GP), contact with dental services, and hospitalisation.

		All		Ľ	Danish-b	oorn	C	Other-W	estern	1	Non-We	stern
	N	User %	Non-user %	N	User %	Non-user %	N	User %	Non-user %	N	User %	Non-user %
				84 489	74	26	5484	67	33	5891	61	39
Age												
-49	5103	68	32	4121	70	30	333	56	44	649	61	39
50-54	51 342	75	25	44 350	76	24	3213	69	31	3780	64	36
55–59	12 895	75	25	11 648	77	23	708	66	34	539	59	41
60–64	12 545	72	28	11 406	74	26	600	69	32	539	50	50
65–69	13 979	64	36	12 964	64	36	631	65	35	384	49	51
Education												
Low	41 379	70	30	37 778	70	30	1505	69	31	2096	63	37
Medium	45 930	76	24	41 389	77	23	2651	72	28	1890	66	34
High	5223	72	28	4358	73	27	558	65	35	307	57	43
Employment												
Yes	53 215	80	20	48 594	80	20	2741	75	25	1880	70	30
No	41 551	64	36	35 530	65	35	2429	60	40	3592	57	43
Household size												
1 person	39 460	67	33	36 126	67	32	2094	62	38	1240	56	44
2-4 persons	53 382	78	22	47 091	79	21	2778	75	25	3513	65	35
5 or more persons <i>GP</i>	710	70	30	330	78	22	30	70	30	350	63	37
Contact	84 041	75	25	74 365	76	24	4575	72	28	5101	65	35
No contact	11 823	56	44	10 124	58	42	909	42	58	790	38	62
Dental services												
User	58 130	80	20	53 124	81	19	3046	78	22	1960	73	27
Non-user	37 734	61	39	31 365	62	38	2438	54	46	3931	55	45
Hospitalisation												
0 days	79 863	73	27	70 696	74	26	4612	67	33	4555	60	40
1–5 days	3285	75	25	2913	75	25	174	69	31	198	65	35
5 or more days	11 667	70	30	10 041	71	29	620	73	27	1006	65	35

living within households of two to four persons compared to women living alone. The adjusted OR was 0.63 (95% CI, 0.61–0.65) among Danish-born women; 0.60 (95% CI, 0.53–0.69) among women born in other-Western countries; and 0.74 (95% CI, 0.64–0.85) among non-Western women living in these medium-sized households. The probability of becoming a non-user was slightly higher among women living within households of five or more persons, although results among other-Western and non-Western women did not reach statistical significance (Table III).

Use of primary healthcare services had a strong effect on the likelihood of becoming a user of mammography screening. The adjusted OR for non-use among women who had not had any contact with a general practitioner was 2.19 (95% CI, 2.09–2.29) among Danish-born women, and even higher among women born in other-Western and non-Western countries; 2.73 (95% CI, 2.33–3.20) and 2.67 (95% CI, 2.27–3.14), respectively. The same pattern was found in relation to use of dental services although this determinant did not show the same strong association among women born in non-Western countries (Table III).

Hospitalisation had a significant effect among Danish-born women with women hospitalised for one to five days having the lowest probability of becoming a non-user with an OR at 0.88 (95% CI, 0.80–0.96) compared to women who had not been hospitalised the year before first invitation. Danishborn women who had been admitted to hospital for five or more days had a significantly higher probability of becoming a non-user with OR at 1.19 (95% CI, 1.13–1.25) (Table III). Trends seemed to differ across groups, although results were not significant.

We found significant differences in the relative effect of most independent variables across country of birth. Most differences were seen when comparing women born in non-Western countries to Danishborn women, while effects among women born in other-Western countries were more similar to the patterns observed among Danish-born women (Table III). Among Danish-born women and women born in other-Western countries, being 60–64 years old were protective against becoming a non-user, while non-Western women in this age-group were the least likely to participate in mammography screening. These differences in effects were significant.

	Other- I	-Western vs. Danish	Non-Western vs. Danish			
	OR	95% CI	OR	95% CI		
Crude	1.38	1.30-1.46	1.80	1.71-1.90		
Adjusted for age	1.42	1.34-1.50	1.89	1.79-2.00		
Adjusted for age, dental services	1.32	1.25–1.41	1.44	1.36–1.52		
Adjusted for age, dental services, employment	1.25	1.17-1.32	1.21	1.14-1.28		
Adjusted for age, dental services, employment, contact with GP	1.21	1.13-1.28	1.21	1.15–1.29		
Adjusted for age, dental services, employment, contact with GP, household size	1.20	1.12–1.27	1.30	1.23–1.39		
Adjusted for age, dental services, employment, contact with GP, household size, education	1.14	1.07-1.21	1.20	1.12–1.28		
Adjusted for age, dental services, employment, contact with GP, household size, education, hospitalisation	1.14	1.06–1.21	1.19	1.11–1.27		

Table II. Odds ratios of non-use of mammography screening sequentially adjusted. The order of the explanatory variables reflects the magnitude of significance in a model with one explanatory variable in addition to country of birth and age.

Trends in the association between educational level and use of mammography screening were similar across groups, whereas not being employed played a significantly smaller role among women born in non-Western countries. Living with others was significantly more protective among Danish-born women and had a lower protective effect among women born in other-Western countries. Not having contact with a GP was significantly more important for both women born in other-Western and non-Western countries compared to Danish-born women. Contrary to this, contact with dental services were of 13% less importance among women born in non-Western countries compared to the Danish-born women. The effect of being hospitalised for five or more days was significantly different among both migrant groups as compared to Danish-born women. Among migrant women, being hospitalised for five or more days was protective against becoming a non-user of mammography screening, while the opposite pattern was observed among Danish-born women.

#### Discussion

We found differences in use of the organised mammography screening programme in Copenhagen according to country of birth with Danish-born women being the most likely to attend mammography screening compared to women born in other-Western or non-Western countries. Main determinants of becoming a non-user were not having used dental services, not being employed, having no contact with a general practitioner, living alone, and being welleducated. These trends across independent variables are consistent with previous studies of determinants of use of mammography screening among diverse populations [3,4,12,17,18]. Except in the case of age and hospitalisation, trends in effects of determinants were similar across country of birth, but the relative importance of the specific determinants in explaining use of mammography screening differed across groups. Furthermore, comparisons of the significance of effect sizes showed more significant differences in the effect of determinants when comparing women born in non-Western countries to Danishborn women while women born in other-Western countries took an intermediate position. These differences in the importance of determinants of use of mammography screening emphasise the need for conducting refined analyses distinguishing among subgroups within diverse populations, since effect sizes, associations and underlying causal mechanisms may differ according to country of birth. For instance, the finding that use of dental services is not as important for use of mammography screening among women born in non-Western countries as it is for Danish-born women might be interpreted as a result of use of dental services (requiring co-payment) being more a reflection of socioeconomic position and to a lesser degree a reflection of an inclination to engage in preventive health behaviours among women born in non-Western countries.

Household size was found to be a determinant of use of mammography screening with women living within households of two to four persons being the most likely to participate in screening. This pattern was found consistently across countries of birth, and lends support to theories suggesting a positive association between social integration and health behavior due to knowledge of and inclination to engage in selfcare [12,18,19]. In Denmark, co-habitation without marriage is prevalent making data on marriage-status less suited when measuring social networks. Household size was used as a proxy for access to social support, but this measure reflects only structural aspects of social networks, which may or may not provide social support conducive to the decision to participate in mammography screening. Thus, whilst the importance of social support for use of mammography screening across country of birth seems confirmed in our study if household size actually reflects social support, more knowledge is needed concerning the mechanisms underlining the association between living in medium sized households and the decision to utilise mammography screening.

Dani 5% CI	ish			Other-W	004000			NT				Ratio	of OR	
5% CI					CSICILI			M-non	/estern					
	OR Adj	95% CI	OR Crude	95% CI	OR Adj	95% CI	OR Crude	95% CI	OR Adj	95% CI	D/other W	95% CI ]	D/non-W	95% CI
6-1.45	1.45	1.34–1.56	1.77	1.41-2.22	1.64	1.28-2.11	1.1	0.95-1.34	1.19	1,00-1,43	1.14	0.87-1.48	0.82	0.68-1.00
	1		1		1		1	1	1		1	I	1	1
3-1.03	0.83	0.79-0.87	1.15	0.97 - 1.37	0.96	0.79 - 1.16	1.23	1.02 - 1.48	1.01	0.82 - 1.23	1.16	0.95 - 1.41	1.21	0.99 - 1.49
0-1.21	0.76	0.72 - 0.80	1.02	0.84 - 1.23	0.84	0.68 - 1.03	1.74	1.45 - 2.09	1.18	0.96 - 1.45	1.10	0.89 - 1.37	1.56	1.26 - 1.93
4 - 1.89	1.03	0.98 - 1.08	1.22	1.02 - 1.46	06.0	0.73 - 1.10	1.83	1.48 - 2.26	1.17	0.92 - 1.48	0.87	0.71 - 1.08	1.14	0.89 - 1.45
	1	ı	1	ı	1	ı	1	ı	1	ı	1	ı	1	·
8-0.72	0.98	0.95 - 1.02	0.89	0.77 - 1.02	1.02	0.88 - 1.20	0.88	0.77 - 1.00	1.00	0.87 - 1.15	1.04	0.89 - 1.22	1.02	0.88 - 1.18
1-0.93	1.35	1.25 - 1.46	1.20	0.97 - 1.47	1.40	1.11 - 1.76	1.30	1.02 - 1.65	1.51	1.17 - 1.95	1.03	0.81 - 1.32	1.12	0.86 - 1.46
ı	1	ı	1	ı	1	ı	1	ı	1	·	1	ı	1	,
2-2.26	1.87	1.80 - 1.95	2.03	1.80 - 2.28	1.71	1.49 - 1.96	1.82	1.62 - 2.05	1.60	1.41 - 1.82	0.91	0.79 - 1.05	0.85	0.75 - 0.98
ı	1	ı	1	ı	1	ı	1	ı	1	ı	1	I	1	,
4 - 0.58	0.63	0.61 - 0.65	0.57	0.50 - 0.64	0.60	0.53-0.69	0.69	0.60 - 0.79	0.74	0.64 - 0.85	0.96	0.84 - 1.10	1.18	1.02 - 1.36
5-0.75	0.66	0.51-0.87	0.71	0.32 - 1.56	0.82	0.36 - 1.88	0.75	0.59 - 0.95	0.78	0.60 - 1.00	1.24	0.52 - 2.96	1.17	0.81 - 1.70
ı	1	ı	1	ı	1	ı	1	ı	1	ı	1	ı	1	ı
4–2.33	2.19	2.09–2.29	3.65	3.15 - 4.23	2.73	2.33–3.20	3.03	2.59 - 3.53	2.67	2.27 - 3.14	1.24	1.05 - 1.47	1.22	1.03 - 1.44
ı	1	ı	1	ı	1	ı	1	ı	1	·	1	ı	1	·
7-2.63	2.17	2.10 - 2.24	2.94	2.62 - 3.30	2.30	2.02 - 2.61	2.15	1.91 - 2.42	1.89	1.67 - 2.13	1.06	0.93 - 1.21	0.87	0.77 - 0.99
ı	1	ı	1	ı	1	ı	1	ı	1	ı	1	I	1	·
6 - 1.02	0.88	0.80-0.96	0.89	0.65 - 1.24	1.11	0.79 - 1.57	0.81	0.60 - 1.09	0.85	0.62 - 1.15	1.27	0.88 - 1.81	0.96	0.70 - 1.33
5-1.26	1.19	1.13-1.25	0.73	0.61-0.88	0.85	0.70-1.04	0.82	0.71-0.94	0.93	0.80-1.08	0.72	0.58-0.88	0.78	0.67-0.92
4 w 1 0 4 w 4 v 0 0	$\begin{array}{c} 1.89 \\ 0.72 \\ 0.93 \\ 0.58 \\ 0.58 \\ 0.75 \\ 2.33 \\ 2.63 \\ 1.02 \\ 1.26 \\ 1.26 \end{array}$	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	$ \begin{array}{ ccccccccccccccccccccccccccccccccccc$	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$

Table III. Odds ratio of non-use of mammography screening according to country of birth and by age, education, employment, household size, contact with general practitioner (GP), contact

In addition, living alone may reflect different mechanisms among women born in non-Western countries as opposed to the other two groups and the association to use of mammography screening may be of a different nature across groups. For instance, living alone may reflect an urban effect among women born in Denmark and perhaps also among women born in other-Western countries, while it may be a result of restrictions in possibilities for family reunification among women born in non-Western countries. Questionnaire surveys and qualitative studies among ethnic minorities and migrants have shown social connection (defined as social roles, social networks and social support) to be important for uptake of mammography screening among African-American women [10,11]. An interview study among 576 urban African-American women found social roles and social networks to be positively associated with screening knowledge, and networks within families were associated with both screening recency and intention [10]. The authors concluded that mammography-related knowledge is enhanced primarily through social structures, such as family or neighborhood in combination with connectedness to the larger society. Whether differences in level of social integration into neighborhoods and into society at large according to country of birth could be additional determinants explaining differential use of mammography screening among migrants and nonmigrants should be explored in future studies. Although we found household size to have a significant effect on the probability of participating in mammography screening programmes, the explanatory effect was lower compared to use of primary healthcare services and employment status reflecting socioeconomic position. This finding is consistent with findings from a study on the relationship between social networks and cancer screening among four US Hispanic groups using a social network index based on number of close relatives and friends, frequency of contact, and church membership [12]. Only a modest, non-significant effect on mammography screening was found which may reflect that the effects of social networks may be modest at best compared to other, more important determinants, such as insurance status and physician influence.

Whilst guidelines for quality assurance in mammography screening programmes recommend participation rates of 70% regardless of the country of birth of women in the invited group, one might reflect on whether the decision not to become a user is influenced by the perceived risk of developing breast cancer. Great geographical variation in the age-standardised incidence rate for breast cancer ranging from 71 per 100 000 in high-income countries to 17 per 100 000 in low-income countries makes it plausible that migrant women originating in countries with less risk may perceive their risk to be lower than women born in countries with higher incidences of breast cancer [20]. Thus, migrants may have lower likelihood of reporting a family history of cancer and less prevalent risk behavior, e.g. in regard to high age at pregnancy, compared to the general population which may explain some of the differences in use of mammography screening across country of birth [21,22]. In addition, migrant women may perceive breast cancer as an incurable disease, again related to conditions, such as poor outcomes of breast cancer treatment in their country of birth, causing them to decline participation in mammography screening programmes [23]. Thus, different and complex processes may be involved in the decision to participate in mammography screening across migrant and non-migrant groups, pointing both to a need for future studies and for interventions targeting the particular individual and social circumstances for women invited to mammography screening if equal participation in mammography screening is to be achieved.

Other studies have shown a U-shaped association between educational level and low screening participation which may be explained by a more critical approach to pros and cons of participating in mammography screening among women within the higher educational group [17]. The association was not as clear in our data which may be due to our choice of dividing educational level into only three categories in order to avoid low cell counts among migrant women. However, women in the higher range of the educational scale were still the least likely to participate in mammography screening, and for non-Western women the trend across educational groups seemed to be even stronger than for Danish-born women. This finding challenges the often used explanation of migrants' less use of screening programmes with referral to their lack of knowledge of such programmes. In contrary, it is possible that both migrant and Danish-born women within the high education group exhibit a more critical approach to screening programmes. Nevertheless, migrant women may in addition face informal barriers due to language differences which may cause information regarding aim and content of mammography screening programmes to be less accessible and acceptable to migrants [24]. The invitation is written in Danish and may thus in practice be inaccessible to women not possessing the required language skills. Inequality in access to healthcare services by country of birth may be unjust if they arise from inadequate access to knowledge or available services. Migrants should therefore be able to access information on mammography screening in their own language in order to make an informed choice on whether to participate in such programmes.

In general, Danish registries are sources of valid, complete and long-term information on selected socioeconomic characteristics and use of healthcare services among the population. Constructing valid and accurate data on level of education for migrants may be difficult due to lack of transferable data on degree of education from their country of residence prior to migrating. Our study used a combination of register data, self-reported data and imputed values for migrants to measure level of education. In our analysis, trends of explanatory power attributed to this determinant were consistent across groups leading us to conclude that the method for constructing data on this socioeconomic variable among migrants was adequate. Use of mammography screening was based on data from an organised mammography screening programme offered by the national healthcare services. Whilst we cannot exclude the possibility that some women may choose to obtain screening elsewhere (such as in the country of birth of migrant women or in private screening services) we do not judge this to be frequent [25].

Caution should be taken when interpreting results in relation to country of birth among migrants who due to limited numbers of women born in different countries were combined into two broad categories (born in other-Western or non-Western countries). These methodological choices disguise any difference among women based on country of birth, thus ignoring the huge diversity in, e.g. type of migration or breast cancer incidence in country of origin which may influence the probability of becoming a non-user. Furthermore, the ROR has low power in detecting differences between ORs since we in this part, in contrary to elsewhere, were analysing data on an aggregated (and not individual) level. Thus the number of significant differences found here might be a conservative estimate for the actual number of differences between Danish-born women and migrant groups.

In conclusion, household size, socioeconomic position and use of healthcare services were determinants of participation in mammography screening and could partly explain differences in use across migrant groups and Danish-born women. Except in the case of age and hospitalisation, trends regarding the effect of independent variables were similar across country of birth, but the relative importance of the specific variables in explaining use of mammography screening differed across these groups. This study emphasises the need for conducting refined analyses distinguishing among subgroups within diverse populations when explaining differences in screening behaviour.

#### Acknowledgements

This study was supported by a grant from the Health Insurance Foundation.

**Declaration of interest:** The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

#### References

- World Health Organization. World Cancer Report 2008. Lyon: International Agency for Research on Cancer, World Health Organization; 2008.
- [2] European Commision. European guidelines for quality assurance in breast cancer screening and diagnosis, 4th ed. Luxembourg: European Communities; 2006.
- [3] von Euler-Chelpin M, Olsen AH, Njor S, Vejborg I, Schwartz W, Lynge E. Socio-demographic determinants of participation in mammography screening. Int J Cancer 2008; 122:418–23.
- [4] Schueler KM, Chu PW, Smith-Bindman R. Factors associated with mammography utilization: A systematic quantitative review of the literature. J Women's Health 2008;17: 1477–98.
- [5] Norredam M, Nielsen SS, Krasnik A. Migrants' utilization of somatic healthcare services in Europe – a systematic review. Eur J Public Health Epub 2009 Dec 29.
- [6] Alexandraki I, Mooradian AD. Barriers related to mammography use for breast cancer screening among minority women. J Natl Med Assoc 2010;102:206–18.
- [7] Husaini BA, Emerson JS, Hull PC, Sherkat DE, Levine RS, Cain VA. Rural-urban differences in breast cancer screening among African American women. J Health Care Poor Underserved 2005;16(4 Suppl A):1–10.
- [8] Davis C, Emerson JS, Husaini BA. Breast cancer screening among African American women: Adherence to current recommendations. J Health Care Poor Underserved 2005; 16:308–14.
- [9] Berkman LF, Glass T, Brissette I, Seeman TE. From social integration to health: Durkheim in the new millennium. Social Sci Med 2000;51:843–57.
- [10] Klassen AC, Washington C. How does social integration influence breast cancer control among urban African-American women? Results from a cross-sectional survey. BMC Women's Health 2008;8:4.
- [11] Satia JA, Galanko JA. Demographic, behavioral, psychosocial, and dietary correlates of cancer screening in African Americans. J Health Care Poor Underserved 2007;18:146–64.
- [12] Suarez L, Ramirez AG, Villarreal R, Marti J, McAlister A, Talavera GA, et al. Social networks and cancer screening in four U.S. Hispanic groups. Am J Prev Med 2000; 19:47–52.
- [13] Katapodi MC, Facione NC, Miaskowski C, Dodd MJ, Waters C. The influence of social support on breast cancer screening in a multicultural community sample. Oncol Nurs Forum 2002;29:845–52.
- [14] van Jaarsveld CH, Miles A, Edwards R, Wardle J. Marriage and cancer prevention: Does marital status and inviting both spouses together influence colorectal cancer screening participation? J Med Screen 2006;13:172–6.
- [15] Utzon-Frank N, Vejborg I, von Euler-Chelpin M, Lynge E. Balancing sensitivity and specificity: Sixteen year's of experience from the mammography screening programme in Copenhagen, Denmark. Cancer Epidemiology 2011 (in press).

#### 36 M. Kristiansen et al.

- [16] Altman DG, Bland JM. Interaction revisited: The difference between two estimates. BMJ 2003;326:219.
- [17] von Euler-Chelpin M, Olsen AH, Njor S, Jensen A, Vejborg I, Schwartz W, et al. Does educational level determine screening participation? Eur J Cancer Prevent 2008;17:273–8.
- [18] Bankhead CR, Brett J, Bukach C, Webster P, Stewart-Brown S, Munafo M, et al. The impact of screening on future healthpromoting behaviours and health beliefs: A systematic review. Health Technol Assess 2003;7:1–92.
- [19] Pasick RJ, Burke NJ. A critical review of theory in breast cancer screening promotion across cultures. Annu Rev Public Health 2008;29:351–68.
- [20] Ott JJ, Ullrich A, Mascarenhas M, Stevens GA. Global cancer incidence and mortality caused by behavior and infection. J Public Health Epub 2010 Oct 8.

- [21] Orom H, Kiviniemi MT, Ill WU, Ross L, Shavers VL. Perceived cancer risk: why is it lower among nonwhites than whites? Cancer Epidemiol Biomarkers Prev 2010;19:746–54.
- [22] Katapodi MC, Dodd MJ, Lee KA, Facione NC. Underestimation of breast cancer risk: Influence on screening behavior. Oncol Nurs Forum 2009;36:306–14.
- [23] Randhawa G, Owens A. The meanings of cancer and perceptions of cancer services among South Asians in Luton, UK. Br J Cancer 2004;91:62–8.
- [24] Shaw SJ, Huebner C, Armin J, Orzech K, Vivian J. The role of culture in health literacy and chronic disease screening and management. J Immigr Minor Health 2009;11:460–7.
- [25] Jensen A, Olsen AH, von Euler-Chelpin M, Njor SH, Vejborg I, Lynge E. Do nonattenders in mammography screening programmes seek mammography elsewhere? Int J Cancer 2005;113:464–70.