



Self-assessed health, perceived stress and non-participation in breast cancer screening: A Danish cohort study



Line Flytkjær Jensen^{a,b,c,d,*}, Anette Fischer Pedersen^{a,c}, Berit Andersen^d, Peter Vedsted^{a,c}

^a Research Unit for General Practice, Department of Public Health, Aarhus University, Bartholins Allé 2, Aarhus C 8000, Denmark

^b Section for General Medical Practice, Department of Public Health, Aarhus University, Bartholins Allé 2, Aarhus C 8000, Denmark

^c Research Centre for Cancer Diagnosis in Primary Care (CaP), Department of Public Health, Aarhus University, Bartholins Allé 2, Aarhus C 8000, Denmark

^d Department for Public Health Programs, Randers Regional Hospital, Central Denmark Region, Skovlyvej 1, Randers, NE 8930, Denmark

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ABSTRACT

Objective. Population-based cancer screening is offered in many countries to detect early stages of cancer and reduce mortality. Screening efficiency and equality is susceptible due to a group of non-participants. We investigated associations between self-assessed health, perceived stress and subsequent non-participation in breast cancer screening.

Methods. This population-based cohort study included 4512 women who had participated in a Health Survey in 2006 and who were also the target group (aged 50–69 years) for the first organised breast cancer screening programme -3 years later in the Central Denmark Region in 2008–2009.

Results. A U-shaped association was observed for physical health assessment as women with the highest (PR = 1.28, 95% CI: 1.06–1.55), and the lowest (PR = 1.41, 95% CI: 1.18–1.68) physical health scores were less likely to participate in the programme than women with physical health scores in the middle range. Women with low mental health assessment were more likely not to participate than women with mental health scores in the middle range (PR = 1.44, 95% CI: 1.22–1.69). Higher non-participation propensity was also observed for women with the highest perceived stress scores (PR = 1.27, 95% CI: 1.07–1.51) compared with women scoring in the middle range.

Conclusions. Women with highest and lowest self-assessed physical health, with lowest mental health or highest perceived stress were significantly more likely not to participate in breast cancer screening 2–3 years later than women who reported average health. Interventions targeting these groups may promote equal participation in future breast cancer screening programmes.

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Introduction

The purpose of offering breast cancer screening to women is to detect early stages of cancer and thereby reduce adverse effects of treatment and breast cancer mortality (Vejborg et al., 2011). However, the efficiency of population-based breast cancer screening programmes depends on high attendance (Health and Consumer Protection Directorate-General, 2006).

Various factors have been linked to non-participation in breast cancer screening, including practical (Bulliard et al., 2004; Jensen et al., 2013) and social barriers (Farmer et al., 2007; Price et al., 2010) as well as psychological and demographic factors (Aro et al., 1999; Lagerlund et al., 2014; von Euler-Chelpin et al., 2008). The association between self-assessed health and non-participation in screening programmes has been studied, but often using only a single-item

question (Courtney-Long et al., 2011; Donnelly et al., 2013; Font-Gonzalez et al., 2013; Gandhi et al., 2015; Taylor et al., 2003), and only few studies have applied validated scales (Farmer et al., 2007; Thorpe et al., 2006). The results have in general been inconclusive. Except for one study (Courtney-Long et al., 2011), most studies have not adjusted for morbidities, which may confound the results. Thus, further research using consistent definitions of self-assessed health is called for (Schueler et al., 2008).

Self-assessed health can be measured by the generic Medical Outcomes Study Short-Form Health Survey, which is available in 36-item (SF-36) and 12-item versions (SF-12) (Ware et al., 1996). The SF instruments produce a physical and a mental component summaries (PCS/MCS) for self-assessment of health, but only one study has investigated the association between MCS score and non-participation and found no association (Thorpe et al., 2006). There seems to lack studies using both PCS and MCS scores in exploring the association with non-participation in screening.

Perceived stress also constitutes an aspect of the individual's self-assessed health status. One of the most used scales for self-assessment

* Corresponding author at: Research Unit for General Practice, Department of Public Health, Aarhus University, Bartholins Allé 2, Aarhus C 8000, Denmark.
E-mail address: line.jensen@ph.au.dk (L.F. Jensen).

of stress is the perceived stress scale (PSS) (Cohen et al., 1983). An individual's stress level is believed to be affected by exposure to life events and the individual's ability to cope with these events (Lazarus, 1993). Hence, individuals may react differently to the same stressor (Ogden, 2007). Perceived stress may also affect screening behaviour but this has only been studied scarcely and with mixed results (Aro et al., 1999; Lagerlund et al., 2015; Rakowski et al., 1993).

The influence of both the mental and physical components of the SF12 and perceived stress on screening participation has not been studied with a longitudinal design. The aim of this study was to investigate possible associations between assessment of the SF12 mental and physical components and perceived stress in 2006 and non-participation in the first Danish organised breast cancer screening programme in 2008–2009.

Methods

Breast cancer screening is free of charge in Denmark and is offered biennially to all women aged 50–69 years. Eligible women are invited for screening by the region of their residence. The national screening programme was introduced in Denmark in 2008–2009 when the first screening round was also conducted in the Central Denmark Region.

We performed a historical cohort study in the Central Denmark Region and linked the SF12 scale and perceived stress data with non-participation in screening in 2008–2009. The following two inclusion criteria were applied: eligible women must have participated in the Health Survey in 2006 and must also have been invited for the first breast cancer screening round in the Central Denmark Region in 2008–2009. In total, 5955 women were invited to both the Health Survey and the first screening round. Of these, 4512 women (76%) responded to the Health Survey in 2006 and were thus included in the analyses.

Data collection and variables

All Danish citizens have a unique 10-digit ID code, which is generally referred to as the civil registration number (CRN) (Pedersen, 2011). This number was used to link all data in this study.

Screening non-participation

Data on non-participation in the first round of breast cancer screening in the Central Denmark Region were collected from a regional administrative database together with each woman's unique 10-digit CRN. A woman was categorised as 'participant' if she participated in the first screening round and as 'non-participant' if not. This study only assessed non-participation in the organised screening programme and thus not clinical mammography. As organised breast cancer screening was implemented in the Central Denmark Region in 2008–2009, screening behaviour prior to this could not be assessed.

Health survey data

Data on self-assessed health (SF-12) and perceived stress (PSS) were collected from a Health Survey (in Danish: *Hvordan har du det?*) conducted in the Central Denmark Region in 2006. The questionnaire (only in Danish) contained approximately 400 items on, e.g., health behaviour and self-assessed health and perceived stress (Breinholt et al., 2008). A sample of 31,500 persons was randomly drawn from the Danish Civil Registration System and invited to respond to the questionnaire. The following inclusion criteria were applied for the Health Survey: being a Danish citizen (at least one parent born in Denmark), aged 25–79 years and living in the Central Denmark Region. The response rate was 69% (Breinholt et al., 2008).

Measurement of self-assessed health (PCS/MCS)

The SF-12 include the Physical Component Summary (PCS) score and the Mental Component Summary (MCS) score (Ware et al., 1996)

and was used in this study to measure self-assessed health. The validity and the reliability of the SF-12 have been documented in both Danish and international settings (Christensen et al., 2013; Luo et al., 2003). The PCS and MCS scores in our study were calculated with the algorithm recommended by Ware et al. (1995). Scores range from 0 to 100; high scores indicate better self-assessed health, while 50 represents an average health score (Ware et al., 1996).

Measurement of perceived stress

The level of perceived stress was measured by the 10-item perceived stress scale (PSS) (Cohen et al., 1983). Each item is rated on a five-point Likert scale (0 = never to 4 = very often). The total sum-score is generated after reverse-scoring items 4, 5, 7 and 8. Scores range from 0 to 40; high scores indicate higher perceived stress.

Possible confounders

Variables on socio-economic position (SEP) in 2006 were included as confounders and were obtained from Statistics Denmark (Statistics Denmark, 2014). The following variables were included: *marital status* (married/cohabitating or single), *education* (low: ≤ 10 years, middle: 11–15 years and higher education: > 15 years) (UNESCO, 2014), *OECD-adjusted household income* (low, middle and high income) (OECD, ND), and *age* on 1 January 2006 (used as a continuous variable in the analyses).

The women's chronic diseases were assessed and included on the basis of data from the Danish National Patient Register (Lyngge et al., 2011) and the Danish Psychiatric Central Research Register (PCRR) (Mors et al., 2011), which holds information on all hospital-related contacts in the Danish health care system. Women with chronic diseases were identified from the records on chronic disease registered in the hospital system 0–10 years prior to the screening. These diseases were selected on the basis of previous research in this field (Barnett et al., 2012; Diederichs et al., 2011) and included cardiovascular diseases, cancer, hypertension, mental diseases, diabetes, COPD, chronic neurological disorders, chronic arthritis, chronic bowel disease, chronic liver disease and chronic kidney disease.

Statistical methods

Non-participation in the first organised breast cancer screening programme was assessed using prevalence ratios (PRs) with 95% confidence intervals (CIs) using generalised linear models (GLM) (Barros and Hirakata, 2003; Zou, 2004). PRs were preferred as outcome measure over odds ratios (ORs) as ORs have been found to overestimate associations when the prevalence of the outcome is frequent (Barros and Hirakata, 2003). The scales were divided into three groups based on the score distribution in this data set: $< 25\%$, 25–75% and $> 75\%$. The rounded absolute scores are as follows: for the PCS scale: 0–25%, 5.06–44.71; > 25 –75%, 44.71–56.42; $> 75\%$, 56.42–73.44; for the MCS scale: 25%, 4.48–46.43; > 25 –75%, 46.43–57.33; and $> 75\%$, 57.33–73.98; and finally for the PSS scale: 25%, 0–7; > 25 –75%, 7–15; and $> 75\%$, 15–36. The middle group was used as a reference because this category included women with a score of 50 for the PCS and MCS scale, corresponding to an average health score (Ware et al., 1996) or included the score of 12 corresponding to the median perceived stress score. Unadjusted GLM analyses were made for each of the independent variables, followed by model 1 adjusted for age, education and marital status and model 2 adjusted for the variables in model 1 and chronic disease (divided into: 0 (reference), 1, 2 and ≥ 3 diseases). Robust variance estimates were applied to adjust for clustering of patients in general practices in all models to rule out possible effects of the individual GP's attitude on participation rate (Jensen et al., 2012). Data on which GP each woman was listed with on the scheduled screening date were obtained from the Danish National Health Service Register.

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