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Health and health belief factors associated with screening and help-seeking behaviours for breast cancer symptoms: a systematic review and meta-analysis of the European evidence

Short title: *Help-seeking and screening for breast cancer symptoms*

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Abstract

Purpose: The aim of this systematic review was to identify health or health belief factors associated with mammography attendance or with self-initiated medical help-seeking for breast cancer symptoms among women in Europe.

Methods: Five databases were searched for articles published between 2005 and 2018. Meta-analyses were conducted for 13 factors related to screening attendance and two factors associated with help-seeking behaviour. Where there were too few studies to include in the meta-analysis a narrative synthesis was undertaken.

Results: Sixty-five studies were included. Never having had cervical screening ($d=-0.72$, $p<0.001$) and higher perceived barriers to mammography ($d=-0.40$, $p<0.001$) were associated with lower levels of screening attendance. Possessing health insurance ($d=0.49$, $p<0.001$), greater perceived benefits ($d=0.31$, $p<0.001$) and motivation ($d=0.36$, $p=0.003$) towards screening, and higher perceived seriousness ($d=0.24$, $p=0.019$) and susceptibility ($d=0.20$, $p=0.024$) towards breast cancer were associated with a higher level of screening attendance. Presenting with a non-lump symptom was associated with a longer time to presentation ($d=0.32$, $p<0.001$). The narrative synthesis revealed that previous benign breast disease was associated with a higher level of screening attendance but with a longer time to presentation.

Conclusions: The review identified key similarities in factors associated with screening and help-seeking behaviours which offer scope for combined interventions aimed at women that target both behaviours. Furthermore, the review highlighted that fewer studies have focused on help-seeking behaviour, despite two thirds of breast cancer cases being self-detected. Future research should further examine predictors of help-seeking behaviour including a focus on modifiable factors, such as BMI, and physical activity.

Keywords: Breast cancer, screening, mammography, help-seeking, meta-analysis

Breast cancer is the most common cancer in Europe, accounting for around 14% of all cancer cases (Ferlay et al., 2013) with regional variation and higher incidence rates in Northern and Western Europe (121 per 100,000 and 127 per 100,000) compared to Central and Eastern Europe (63 per 100,000) (Ferlay et al., 2013). Incidence rates differ due to variation in the prevalence of risk factors across countries including age, ethnicity, obesity, alcohol consumption, smoking, and a high fat diet (WHO, 2011). Europe as a whole has lower 5-year survival rates than other westernised regions including the United States of America (USA) and Australia (Coleman et al., 2008), which may reflect differences in breast cancer treatment and surgery practices (De Angelis et al., 2014).

Encouraging engagement in early detection behaviours (such as screening or prompt help-seeking) is important as it may be associated with better prognosis (Richards, Westcombe, Love, Littlejohns, & Ramirez, 1999). Screening programmes in the UK are estimated to save 1300 lives each year (Marmot et al., 2013). The majority of European countries either have established screening programmes or are planning or piloting a programme (Deandrea et al., 2016). Around one third of breast cancers in the UK are diagnosed via screening (NCIN, 2013) with the remaining majority through self-detection and subsequent help-seeking. This underscores the public health need to understand and promote both of these behaviours to support early detection of the disease. Prompt help-seeking following self-discovery of a breast symptom is associated with better survival rates. A longer time to presentation (i.e., the time from recognition of a symptom to the first consultation with a healthcare professional) of three months or more is associated with a 12% lower 5-year survival rate than presenting within three months of symptom discovery (Richards et al., 1999). Yet 20-30% of women take over three months to seek help (Maghous et al., 2016; Ruddy et al., 2014).

Seeking help for breast cancer symptoms and attending a screening program are different behaviours. Women may be asymptomatic when attending for breast screening,

whereas help-seeking requires awareness of potential symptoms of a disease that then prompts the help-seeking process. The distinction is not always clear, however, as some people who are aware of a symptom may choose to wait for their next routine screening to have this investigated, in which case screening becomes part of the help-seeking process (Solbjør, Skolbekken, Sætnan, Hagen, & Forsmo, 2012). They can however be considered together as they are both practices to enable early detection and are both potential healthcare avoiding actions (Byrne, 2008). Breast cancer is detected in only a very small number of routine screening appointments (8.4 per 1000 women; NHS Digital, 2019) and following help-seeking a large number (9 out of 10) of GP referrals for breast lumps result in an outcome that is non-cancerous (Cancer Research UK, 2017). The possibility of a diagnosis of breast cancer may lead to increased anxiety which promotes prompt healthcare utilisation or screening attendance, however, as such a diagnosis carries a high personal threat it can also lead to avoidance behaviour (Byrne, 2008; Rogers, 1975). In addition, women who demonstrate a longer time to presentation are also less likely to participate in screening (Heisey et al., 2011).

Help-seeking and screening behaviours are associated with sociodemographic and socioeconomic factors, health behaviours, attitudes, knowledge, health beliefs and cancer awareness (Arndt et al., 2002; Drossaert, Boer, & Seydel, 2003; Fontana & Bischoff, 2008; Hunter, Grunfeld, & Ramirez, 2003; Szczepura, Price, & Gumber, 2008).

These factors align with established theories of health behaviour, including the Common Sense Model (CSM; Leventhal, Brisette, & Leventhal, 2003) which is applicable because of the symptomatic nature of help-seeking and theories such as The Theory of Planned Behaviour (TPB; Ajzen, 1991) to explain attitudes and beliefs, Protection Motivation Theory (Rogers, 1975) and the Health Belief Model (Rosenstock, 1974) to explain response to a threat, are applicable to both screening and help-seeking behaviours. Theories of health behaviour have a key role in studies aimed at explaining and predicting behaviour and can also guide a

systematic approach to intervention design (Painter, Borba, Hynes, Mays, & Glanz, 2008; Webb, Joseph, Yardley, & Michie, 2010).

Screening behaviour is more accessible to study than help-seeking behaviour as help-seeking will only occur if and when symptoms are detected, whereas a screening program is an invited event that can be studied prospectively. Therefore, looking at these two behaviours together may help better our understanding of factors that also affect help-seeking behaviour. Previous reviews have examined factors influencing screening behaviour (Andreeva & Pokhrel, 2013; Edgar, Glackin, Hughes, & Rogers, 2013; Jerome-D’Emilia, 2015) and help-seeking behaviour (Alhurishi, Lim, Potrata, & West, 2011; Caplan & Helzlsouer, 1992; Ramirez et al., 1999) separately but not in a combined review which limits the ability to make clear comparisons and identify similarities in factors influencing performance of the two behaviours. Furthermore, to date no review has focused exclusively on European populations, which is important to improve understanding of factors that affect early detection of breast cancer in an area with an overall lower 5-year survival rate than other westernised regions (Coleman et al., 2008). Rather than focus on socio-demographic factors where there is already well-established literature (Arndt et al., 2002; Ramirez et al., 1999), the aim of this review was to identify health and health belief factors that are associated with routine breast cancer screening attendance and symptomatic help-seeking behaviour among women in Europe.

Methods

This review and meta-analysis conforms to the PRISMA 2009 guidelines (Liberati et al., 2009) (Supporting Information Table_S1).

Search Strategy

The research question was developed through discussion with a psychologist, a researcher with a track record in help-seeking research and through evaluation of previous reviews within the help-seeking literature. The search strategy was defined by input from all

authors along with consultation with a university subject librarian who provided advice regarding which databases would be relevant to the research question and who oversaw the choice of search terms to be utilised across databases. Five databases (CINAHL, MEDLINE, PSYCINFO, SCOPUS, and ASSIA) were searched using four searches: Block 1: breast* AND (cancer* or neoplasm* or tumor* or tumour* or carcinoma); Block 2: barrier* or facilitat* or uptak* or utilis* or utiliz* or avoid* or delay*; Block 3: 'delay* present*' or 'late* present*' or 'early* present*' or 'symptomatic present*' or 'patient* delay*' or 'help* seek*' or healthcare-utills* or healthcare-utiliz* or healthcare-avoid*; Block 4: PUBYEAR > 2004. Results of the four searches were combined using the AND function. Backwards (reference) and forward (citation) searches of the included papers were conducted to identify any additional relevant papers.

Inclusion/Exclusion

Articles were included if they were (1) published in English; (2) published between January 2005 and July 2018 (the date of the last search); (3) were observational, i.e. without manipulation or intervention of the outcome variables; (4) reported quantitatively on health or health belief factors associated with screening or help-seeking behaviour for breast cancer symptoms; (5) data were collected from participants within Europe. *Health factors* were defined as modifiable actions undertaken in order to prevent or detect disease for the improvement of health. *Health beliefs* were defined as attitudes and perceptions of health and illness. Included within this are factors which may affect those beliefs such as knowledge, awareness, emotions, and previous experience. Only studies from 2005 onwards were included in order to focus on the most recent research and because screening practices and guidelines have changed since the mid 2000's when many European countries were only just establishing their routine screening programmes. Observational studies were included and a decision was made to exclude interventional studies, because although these would report baseline data on

health beliefs, and clinical or health factors, these would not be correlated or reported in relation to help-seeking intentions or behaviour at baseline.

Articles were excluded if they were (1) qualitative studies, (2), intervention studies, (3) review articles or dissertations and (4) included women with a family history of breast cancer or those recalled for screening due to abnormal results.

Method of Quality assessment

Quality assessment was undertaken independently by two reviewers using a published tool comprising of a checklist developed to assess the quality of the reporting of methods, results, and conclusions of quantitative studies over a wide range of designs including observational research designs (Kmet, Lee, & Cook, 2004). Three of the 14 items were removed as they were not relevant to the included studies. These were specific to intervention studies, concerned with random allocation to treatment and control groups, blinding of investigators and subjects to the treatment/control group. Items were assigned either a rating of 2 (criteria fulfilled), 1 (criteria partially fulfilled), or 0 (criteria not fulfilled). A summary score was calculated as the total score out of a total possible score of 22. High quality papers were defined as scoring 17 or above (77% of possible score), moderate quality between 11 and 16 (50 – 76%), and low-quality papers were those with scores below 10 (<50%). As all studies were at least of moderate quality a decision was taken to weight all studies equally.

Data extraction

The following data were extracted by the first author for each article: authors, year of publication, country where study conducted, factors associated with help-seeking or screening behaviour (including health beliefs, and clinical or health factors), sample size, study design, population and setting, and use of theoretical models. Main outcomes were (1) screening attendance (including % of uptake of screening) and (2) help-seeking behaviour (length of time from symptom to contacting a healthcare professional). A narrative review was conducted

synthesising results of the studies (Table_S2).

Issues with extraction

Although standard BMI categories were used across studies (BMI <18.5 kg/m² as underweight, >18.5 kg/m² and <24.9 kg/m² as healthy weight, >25 kg/m² and < 29.9 kg/m² as overweight, and BMI >30 kg/m² as obese) there was variability in how BMI was reported across studies (e.g. dichotomised variable as obese/non-obese; reported weight categories underweight/healthy weight/overweight/obese); reported waist circumference). This is a limitation therefore in that some studies may have included underweight, healthy weight, and overweight participants within a non-obese category whereas other studies excluded underweight participants from the non-obese category.

Strategy for meta-analysis

A meta-analysis using Comprehensive Meta-Analysis software (V3 Biostat Inc. 2016) was undertaken focusing on the following factors associated with screening intention or behaviour: health factors (body mass index (BMI), physical activity, smoking, diet); previous screening behaviour; health insurance; and health beliefs. Due to the limited number of studies examining factors associated with help-seeking behaviour, analyses were undertaken for only two factors associated with help-seeking: symptom type and fear of being diagnosed with breast cancer. Effect sizes were reported as the Standard Mean Difference (either extracted directly from the paper, or converted from a reported odds ratio, regression coefficient, or calculated if enough data was reported in the study). The meta-analysis was based on a random effects model, which assumes that there is heterogeneity in populations between studies. Publication bias was addressed by the examination of funnel plots and use of the trim and fill method (Duval & Tweedie, 2000b). Tests for homogeneity were conducted using the I² statistic (the proportion of the observed variance which would remain if the sampling error could be removed; Borenstein, Hedges, Higgins, & Rothstein, 2009). Low heterogeneity was signified

by values of 25% and below, moderate heterogeneity 50% and high heterogeneity indicated by an I^2 value greater than 75% (Higgins, Thompson, Deeks, & Altman, 2003).

Methodological rigour

Bias in review design was reduced through the careful design of the research question and predetermination of the inclusion and exclusion criteria. A protocol for this systematic review was developed prior to commencement of the review and reviewed and registered on an international database of prospectively registered systematic reviews in health and social care (PROSPERO ID=CRD42016032618).

Although the search was limited to the English Language and to studies published since 2005, we aimed to reduce bias in locating studies through searching multiple databases (CINAHL, MEDLINE, PSYCINFO, SCOPUS, and ASSIA). Furthermore, the review did not include a search of the grey literature however, it did include backwards (reference) and forward (citation) searches of the included papers to identify any additional relevant papers. In order to reduce bias in selecting studies as a result of personal bias introduced by a single person screening to select studies, this review utilised two reviewers. They independently screened titles and abstracts of the articles for inclusion before the screening of the full-text articles by the first reviewer. Both reviewers provided assessment of the quality of the included papers using the checklist described in the methods section. A third reviewer was then involved in discussion over ambiguous studies and the decision of whether to include or exclude articles where there was disagreement between the first two reviewers.

Finally, bias in synthesising studies can occur as the result of selective reporting where the review authors present only a selection of outcomes or associated factors based on their statistical significance following analysis. The factors influencing help-seeking behaviour examined in this review were predetermined prior to the commencement of the review and

included multiple factors (health beliefs, and clinical or health factors), rather limiting to a single factor.

Results

(Figure 1 here)

4580 unique papers were identified (Figure 1). Following screening of titles, abstracts and full-text articles, 65 relevant studies were included in this review. Fifty-seven studies examined screening attendance, seven studies examined help-seeking behaviour, and one study reported both help-seeking and screening behaviours. Data were reported from 17 European countries with the majority (17 studies) originating in Turkey, followed by Spain (9 studies), the UK (7 studies), and France (7 studies). There was a total of 263,263 participants across studies (two studies did not report sample size) and 27 of the studies analysed secondary data. There were 19 studies (29%) which utilised theoretical models (Table_S2). This was predominantly the Health Belief Model used in 15 of the screening studies. Five studies (8%) were rated as moderate quality with the remaining 60 studies (92%) rated as high quality. Summary results are displayed in Table_S2 with a full breakdown of the scores in Table_S3.

Narrative synthesis

Screening attendance. The most common outcomes reported in the screening studies were having a mammogram within the last two years (21 studies), having had at least one mammogram (19 studies), and attendance at screening over a particular time period (13 studies). Screening attendance ranged from 5% to 96%. Most of the screening studies (77%) included participants who were over the age of 40 (range 16 to over 75, reflecting that invitations for screening in the countries included occur between the ages of 40-50 until 65-74 (Giordano et al., 2012). Thirteen of the screening studies (22%) were taken from mammography attendance records whereas 45 (78%) used self-report data.

Help-seeking. Average time to presentation ranged between 7 days (median) (Koo et al., 2017) to 6 weeks (mean) (Jassem et al., 2014). The proportion of study participants seeking help within thirty days was between 60% (Gözüm & Tuzcu, 2018) (Gözüm & Tuzcu, 2018) and 70% (O'Mahony et al., 2013). Between 9% (Koo et al., 2017) and 42% (Burgess et al., 2006) had a time to presentation of over 90 days.

Factors associated with screening attendance and help-seeking behaviour were divided into three categories: health behaviours; healthcare utilisation; and knowledge and beliefs. Figures 2-4 illustrate the factors associated with both behaviours and the number of studies which were associated with a higher level of screening or prompt help-seeking, and the number of studies associated with lower screening attendance or a longer time to presentation.

Table_S4 lists the studies included for each factor

(Figure 2 here)

(Figure 3 here)

(Figure 4 here)

In the only study reporting both on help-seeking and screening behaviours (Jassem et al., 2014), the countries in which screening attendance rates were higher tended to also report more prompt help-seeking. For example, in Poland screening attendance was 82% and mean help-seeking time was 3.61 weeks, whereas in Romania, screening attendance was 22% and mean help-seeking time was 6.02 weeks.

Meta-analysis

Meta-analyses were conducted for health behaviour and health belief factors associated with screening (Table_S5-S7). Funnel plots were assessed visually (Table_S8) and combined with the Trim and Fill method (Duval & Tweedie, 2000a, 2000b). Never having had cervical screening ($d=-0.72$, $p<0.001$) and perceiving higher barriers to mammography ($d=-0.40$,

$p < 0.001$) were significantly associated with lower mammography screening attendance. Having health insurance ($d = 0.49$, $p < 0.001$), greater perceived benefits ($d = 0.31$, $p < 0.001$) and motivation towards mammography ($d = 0.36$, $p = 0.003$), and higher perceived seriousness ($d = 0.24$, $p = 0.019$) and greater perceived susceptibility towards breast cancer ($d = 0.20$, $p = 0.024$) were significantly associated with a higher level of screening attendance. Although statistically significant; obesity ($d = -0.08$, $p = 0.005$), being a current smoker ($d = -0.11$, $p = 0.025$), and exercising ($d = 0.18$, $p < 0.001$) were not of a sufficient effect size (≥ 0.2) to have confidence in the difference in effect between groups being tested (Cohen, 1992). Due to limited data, meta-analyses were undertaken for only two factors associated with help-seeking behaviour. Presenting with a symptom other than a lump was associated with a longer time to presentation ($d = 0.32$, $p < 0.001$); while fear of being diagnosed with breast cancer was non-significant.

Six of the meta-analyses required use of the Trim and Fill method resulting in an altered effect size which adjusted for the effect of potential publication bias (Table_S4). The results of the publication bias and subsequent adjustments should be treated cautiously however, due to the small number of studies included within each meta-analysis (Borenstein et al., 2009). All meta-analyses had significant heterogeneity in results which would warrant further investigation. Due to the small number of studies included in each meta-analysis, analysis of potential moderators was not possible.

Discussion

The aim of this systematic review and meta-analysis was to identify health behaviour and health belief factors associated with breast cancer screening attendance and help-seeking for symptoms of breast cancer among women in Europe. Results from the meta-analyses suggest that having private health insurance, having had cervical screening and positive health beliefs (e.g. motivation and perceived benefits) are significantly associated with a higher level of breast cancer screening attendance. Presenting with a non-lump symptom was significantly

associated with a longer time to presentation. The narrative synthesis highlighted factors associated with both screening attendance and help-seeking behaviour. Specifically, currently not smoking, higher levels of breast cancer knowledge, positive health beliefs (such as belief in the benefits of screening or treatment), and previous screening history were associated with a higher level of screening attendance and more prompt help-seeking behaviours. While fear of breast cancer was associated with a higher level of screening attendance, it was also associated with both prompt and a longer time to presentation. Differences, however, were found where there was a previous false positive result, which was associated with a higher level of screening attendance but a longer time to presentation.

Although higher BMI was found to be a significant factor in lower screening attendance, the effect size was too small to conclude a difference. This is in contrast with an earlier meta-analysis focusing on studies from USA (Maruthur, Bolen, Brancati, & Clark, 2009) which found an inverse relationship between BMI and having a recent mammogram, such that morbidly obese women were less likely to report having had a mammogram than those of a normal weight. The discrepancy in findings could be due to the USA focus of the Maruthur review, which has a higher prevalence of obesity (35%) than Europe (23%); (WHO, 2016). The Maruthur study also reported lower screening rates among morbidly obese women. However, in the current review only two studies (Beeken, Wilson, McDonald, & Wardle, 2014; Tekkel et al., 2011) reported data for morbidly obese participants and in each study the proportion of included participants was lower (4-8%) than the 10% of morbidly obese women in the USA (Fryar, Carroll, & Ogden, 2018).

Never having cervical screening was associated with a lower likelihood of attending for screening. This is in concordance with previous literature (Andreeva & Pokhrel, 2013; Schueler et al., 2008) and may reflect that attendance at health screenings allows the opportunity for the exposure to and engagement with other services (Ornstein, Jenkins, Litvin,

Wessell, & Nietert, 2013). Alternatively, the person who is health conscious about one aspect of preventive health behaviour may be more likely to be that way about other aspects of their health (Lagerlund, Sparén, Thurfjell, Ekblom, & Lambe, 2000).

Higher ratings on several Health Belief Model (HBM) constructs were associated with a higher likelihood of screening including benefits of mammography, and fewer barriers to mammography (Aiken, West, Woodward, & Reno, 1994; Darvishpour, Vajari, & Noroozi, 2018; Khazir et al., 2019; Wang, Hsu, Wang, Huang, & Hsu, 2014). However, a high perceived risk in combination with low perceived benefits of mammography was associated with a reduced chance of screening attendance (Fair, Monahan, Russell, Zhao, & Champion, 2012). Furthermore, concerns have been raised regarding inconsistencies in the way that HBM variables are operationalised and applied (Armitage & Conner, 2000; Yarbrough & Braden, 2001). Nevertheless, the use of the health belief model in 15 of the studies in this review demonstrates its popularity within the screening literature.

The help-seeking meta-analysis result that non-lump symptoms were significantly associated with a longer time to presentation is an enduring finding that was also reported in a review two decades ago (Ramirez et al., 1999). Screening factors identified in this review are broadly in-line with those reported in an earlier (non-European focussed) systematic review and include private health insurance, access to medical services and health factors (Schueler, Chu, & Smith-Bindman, 2008). Breast screening programmes are free to attend, with the exception of Norway, but in several countries including Belgium, Estonia, and Poland, women without health insurance, prisoners and other hard to reach groups may not be invited, or given access, to mammography (Deandrea et al., 2016). However, a review of health insurance coverage found that having private health insurance was associated with higher education level, higher socioeconomic status, and being married (Harmon & Nolan, 2001), which are also predictors of mammogram attendance, suggesting confounding issues (Schueler et al., 2008).

Additionally, having insurance could potentially provide easier and quicker access to screening outside of the national programme (Menvielle et al., 2014), which might make screening attendance more attractive and accessible.

Similarities between behaviours

A longer time to presentation and lower screening attendance rates were evident among current smokers compared to non-smokers although the overall effect size for this was small. Smokers are less likely to perceive mammography as important in the absence of symptoms and also less likely to perceive other unhealthy behaviours as risk factors for breast cancer (Messina, Kabat, & Lane, 2002). It is likely that smokers downplay health risks in order to continue smoking and preserve a consistent cognitive model of their self and justify their health-related behaviours and minimise cognitive dissonance (McMaster & Lee, 1991). Smokers perceive greater barriers to seeking help, are more worried about clinical findings and more pessimistic about cancer prognosis than non-smokers suggesting a role for pessimism in a longer time to presentation (Quaife, McEwen, Janes, & Wardle, 2015).

Negative perceptions regarding breast cancer and screening and higher perceived barriers to screening were associated with lower screening attendance rates. Similarly, negative perceptions, including distrust of the healthcare system, were associated with a longer time to presentation. Fear about breast cancer increased the likelihood of never having attended a mammogram but was also associated with a greater number of lifetime mammograms (Anagnostopoulos et al., 2012). Therefore, fear acts as both a barrier and as a trigger to seeking help for symptoms (de Nooijer, Lechner, & de Vries, 2001) as found in this review, and how long one takes to seek help may also depend on perceived self-efficacy (Rogers, 1975; Witte, 1992). In the narrative portion of this review, high self-efficacy was associated with a higher level of screening attendance, and perceived behavioural control (a similar construct to self-

efficacy) was a predictor of intentions to seek help in a study examining help-seeking intentions (Hunter et al., 2003). This suggests that interventions which increase self-efficacy in combination with fear appeals may promote more prompt help-seeking and increase screening attendance (Rogers, 1975; Witte, 1992; Witte, Cameron, McKeon, & Berkowitz, 1996).

Differences between behaviours

A *previous false positive* (a mammogram showing abnormalities, which after further investigation prove to be normal) was associated with a higher level of future screening attendance and may, in part, be due to perceived susceptibility remaining heightened in women who have had a false positive in comparison to women who received a normal result (DeFrank & Brewer, 2010). Perceived susceptibility can then act both as a facilitator and also a barrier to future screening depending on how much distress has been caused by the false-positive (Bond et al., 2013), and how much benefit is seen in subsequent screening (Fair et al., 2012). However, this review also revealed that a *previous false alarm* for a symptomatic presentation was associated with a longer time to presentation, and it may be that a previous normal or benign result lowers perception of risk so that new symptoms are interpreted as non-cancerous (Renzi, Whitaker, & Wardle, 2015). Additionally, women who detect a new symptom may prefer to wait for their next scheduled mammogram rather than seeing a doctor earlier (Solbjør, Skolbekken, Sætnan, Hagen, & Forsmo, 2012), or have been over-reassured by a previous benign result and so do not interpret the symptom as being of significance, leading to a longer time to presentation (Renzi et al., 2015; Smith, Pope, & Botha, 2005).

Looking at relationship between the perception of symptoms and breast cancer screening is also crucial. For instance, one study found that women who had detected a lump but had previously had a normal screening result may have felt over-reassured by the screening result and interpreted their symptom to be non-cancerous (Solbjør et al., 2012). It is suggested

that advice should be given regarding what to do if symptoms recur, or if new symptoms emerge, (Renzi et al., 2016) in order to promote early detection.

A variety of theoretical frameworks and models were used in the studies included in this review; the most common of which was the Health Belief Model, which was found to be predictive of screening attendance. However less than 30% of the studies utilised a theoretical framework, which is a similar percentage to that reported over a decade ago (Painter, Borba, Hynes, Mays, & Glanz, 2008), similar to this review. The lack of theoretical models in the current review was perhaps due, in part, to the number of secondary data studies of household population surveys in the review. Using theories of behaviour can help explain and predict behaviour and can aid intervention design (Painter et al., 2008). There is also evidence to suggest that interventions based on theoretical models are more successful (Glanz & Bishop, 2010) than those with no theoretical basis.

There were several limitations in this review. The majority of the screening studies utilised self-report of mammogram attendance and it is known that self-reporting of mammography leads to 15 to 25% greater reporting of attendance than actual attendance rates (Cronin et al., 2009). Furthermore, although a large range of factors were identified, it was often the case that very few papers, sometimes only one, reported results for a specific factor. This made it difficult to balance the weight of the evidence across factors and to draw conclusions when the evidence base was limited, particularly for the help-seeking literature. The selection of full-texts and data extraction was conducted by only one reviewer and therefore may have introduced bias. However, as previously mentioned, in an effort to reduce this bias, any ambiguous studies or questions relating to extraction issues were discussed with another reviewer throughout the process. The findings emphasise the small evidence base of studies that focus on health behaviours and beliefs associated with help-seeking behaviour despite over two thirds of cases being identified through self-detection, as opposed to

screening.

This review highlights the significantly smaller volume of published help-seeking studies compared to screening studies. However, this review only included quantitative studies conducted in Europe and therefore additional help-seeking focused studies may exist outside Europe and within the qualitative literature. Nevertheless, as the majority of breast cancer cases are detected through self-detection rather than screening (NCIN, 2013) there is a clear need for additional high-quality studies focused on predictors of prompt help-seeking for breast cancer symptoms among women residing in Europe. Furthermore, this review has highlighted a need for additional research surrounding modifiable health behaviours and their associations with help-seeking behaviour. BMI can be included in this as it can be regarded as a proxy for healthy behaviour and lifestyle (Menvielle et al., 2014). Given the potential overlap of factors associated with screening attendance and help-seeking behaviour a future consideration may be to target both behaviours together in an intervention, once the effect of modifiable health factors have been established within help-seeking behaviour.

References

References marked with * indicate studies included in the systematic review. References marked with ** indicate studies included in the meta-analysis.

**Acikgoz, A., & Ergor, G. (2013). Compliance with screening recommendations according to breast cancer risk levels in Izmir, Turkey. *Asian Pacific Journal Of Cancer Prevention: APJCP*, *14*(3), 1737–1742.

Aiken, L. S., West, S. G., Woodward, C. K., & Reno, R. R. (1994). Health beliefs and compliance with mammography-screening recommendations in asymptomatic women. *Health Psychology*, *13*(2), 122–129. <https://doi.org/10.1037/0278-6133.13.2.122>

Ajzen, I. (1991). The Theory Of Planned Behavior. *Organizational Behavior and Human Decision Processes*, *50*(2), 179–211. [https://doi.org/10.1016/0749-5978\(91\)90020-t](https://doi.org/10.1016/0749-5978(91)90020-t)

Alhurishi, S., Lim, J. N. W., Potrata, B., & West, R. (2011). Factors Influencing Late Presentation for Breast Cancer in the Middle East: A Systematic Review. *Asian Pacific Journal of Cancer Prevention*, *12*(6), 1597–1600.

**Anagnostopoulos, F., Dimitrakaki, C., Fitzsimmons, D., Potamianos, G., Niakas, D., & Tountas, Y. (2012). Health Beliefs and Illness Perceptions as Related to Mammography Uptake in Randomly Selected Women in Greece. *Journal of Clinical Psychology in Medical Settings*, *19*(2), 147–164. <https://doi.org/10.1007/s10880-011-9272-1>

Andreeva, V. A., & Pokhrel, P. (2013). Breast cancer screening utilization among Eastern European immigrant women worldwide: a systematic literature review and a focus on psychosocial barriers. *Psycho-Oncology*, *22*(12), 2664–2675.

<https://doi.org/10.1002/pon.3344>

Armitage, C. J., & Conner, M. (2000). Social cognition models and health behaviour: A structured review. *Psychology & Health*, *15*(2), 173–189.

<https://doi.org/10.1080/08870440008400299>

Arndt, V., Sturmer, T., Stegmaier, C., Ziegler, H., Dhom, G., & Brenner, H. (2002). Patient delay and stage of diagnosis among breast cancer patients in Germany - a population based study. *British Journal of Cancer*, *86*(7), 1034–1040.

<https://doi.org/10.1038/sj/bjc/6600209>

**Avci, I. A., & Kurt, H. (2008). Health beliefs and mammography rates of Turkish women living in rural areas. *Journal of Nursing Scholarship*, *40*(2), 170–175.

<https://doi.org/10.1111/j.1547-5069.2008.00222.x>

*Barter-Godfrey, S., & Taket, A. (2007). Understanding women's breast screening behaviour: A study carried out in South East London, with women aged 50-64 years. *Health Education Journal*, *66*(4), 335–346. <https://doi.org/10.1177/0017896907083155>

**Baysal, H. Y., & Gozum, S. (2011). Effects of health beliefs about mammography and breast cancer and telephone reminders on re-screening in Turkey. *Asian Pacific Journal Of Cancer Prevention: APJCP*, *12*(6), 1445–1450. Retrieved from <http://search.ebscohost.com/login.aspx?direct=true&db=cmedm&AN=22126479&site=ehost-live>

**Baysal, H. Y., & Polat, H. (2012). Determination of the breast cancer risk levels and health beliefs of women with and without previous mammography in the eastern part of Turkey. *Asian Pacific Journal Of Cancer Prevention: APJCP*, *13*(10), 5213–5217.

**Beeken, R. J., Wilson, R., McDonald, L., & Wardle, J. (2014). Body mass index and cancer screening: findings from the English Longitudinal Study of Ageing. *Journal of Medical Screening*, *21*(2), 76–81. <https://doi.org/10.1177/0969141314531409>

**Bianco, A., Larosa, E., Pileggi, C., Nobile, C. G. A., & Pavia, M. (2017). Cervical and breast cancer screening participation and utilisation of maternal health services: a cross-sectional study among immigrant women in Southern Italy. *BMJ Open*, *7*(10), e016306. <https://doi.org/10.1136/bmjopen-2017-016306>

Bond, M., Pavey, T., Welch, K., Cooper, C., Garside, R., Dean, S., & Hyde, C. J. (2013).

Psychological consequences of false-positive screening mammograms in the UK.

Evidence-Based Medicine, 18(2), 54–61. <https://doi.org/10.1136/eb-2012-100608>

Borenstein, M., Hedges, L. V, Higgins, J. P. T., & Rothstein, H. R. (2009). *Introduction to Meta-Analysis*. Chichester, UK: John Wiley & Sons, Ltd.

<https://doi.org/10.1002/9780470743386>

**Burgess, C. C., Potts, H. W. W., Hamed, H., Bish, A. M., Hunter, M. S., Richards, M. A., & Ramirez, A. J. (2006). Why do older women delay presentation with breast cancer

symptoms? *Psycho-Oncology*, 15(11), 962–968. <https://doi.org/10.1002/pon.1030>

**Bussière, C., Sicsic, J., & Pelletier-Fleury, N. (2014). The Effects of Obesity and Mobility Disability in Access to Breast and Cervical Cancer Screening in France: Results from the National Health and Disability Survey. *PLoS ONE*, 9(8), e104901.

<https://doi.org/10.1371/journal.pone.0104901>

Byrne, S. K. (2008). Healthcare avoidance: a critical review. *Holistic Nursing Practice*, 22(5), 280–292. <https://doi.org/10.1097/01.HNP.0000334921.31433.c6>

Cancer Research UK. (2017). Breast cancer symptoms | Cancer Research UK. Retrieved August 8, 2019, from <https://www.cancerresearchuk.org/about-cancer/breast-cancer/symptoms>

Caplan, L. S., & Helzlsouer, K. J. (1992). Delay in breast cancer: a review of the literature. *Public Health Reviews*, 20(3–4), 187–214.

*Carney, P., O'Neill, S., & O'Neill, C. (2013). Determinants of breast cancer screening uptake in women, evidence from the British Household Panel Survey. *Social Science & Medicine* (1982), 82, 108–114. <https://doi.org/10.1016/j.socscimed.2012.12.018>

*Carrasco-Garrido, P., Hernandez-Barrera, V., Lopez, de A., Jimenez-Trujillo, I., Gallardo Pino, C., & Jimenez-Garcia, R. (2014). Awareness and uptake of colorectal, breast,

- cervical and prostate cancer screening tests in Spain. *European Journal of Public Health*, 24(2), 264–270. <https://doi.org/10.1093/eurpub/ckt089>
- Cohen, J. (1992). A Power Primer. *Psychological Bulletin*, 112(1), 155–159. <https://doi.org/10.1037/0033-2909.112.1.155>
- Coleman, M. P., Quaresma, M., Berrino, F., Lutz, J.-M., De Angelis, R., Capocaccia, R., ... Group, C. W. (2008). Cancer survival in five continents: a worldwide population-based study (CONCORD). *The Lancet. Oncology*, 9(8), 730–756. [https://doi.org/10.1016/s1470-2045\(08\)70179-7](https://doi.org/10.1016/s1470-2045(08)70179-7)
- Cronin, K. A., Miglioretti, D. L., Krapcho, M., Yu, B., Geller, B. M., Carney, P. A., ... Ballard-Barbash, R. (2009). Bias Associated With Self-Report of Prior Screening Mammography. <https://doi.org/10.1158/1055-9965.EPI-09-0020>
- **Damiani, G., Federico, B., Basso, D., Ronconi, A., Bianchi, C. B. N. A., Anzellotti, G. M., ... Ricciardi, W. (2012). Socioeconomic disparities in the uptake of breast and cervical cancer screening in Italy: a cross sectional study. *BMC Public Health*, 12, 99. <https://doi.org/10.1186/1471-2458-12-99>
- Darvishpour, A., Vajari, S. M., & Noroozi, S. (2018). Can Health Belief Model Predict Breast Cancer Screening Behaviors? *Open Access Macedonian Journal of Medical Sciences*, 6(5), 949. <https://doi.org/10.3889/OAMJMS.2018.183>
- De Angelis, R., Sant, M., Coleman, M. P., Francisci, S., Baili, P., Pierannunzio, D., ... Group, E.-W. (2014). Cancer survival in Europe 1999-2007 by country and age: results of EURO CARE--5-a population-based study. *The Lancet. Oncology*, 15(1), 23–34. [https://doi.org/10.1016/s1470-2045\(13\)70546-1](https://doi.org/10.1016/s1470-2045(13)70546-1)
- de Nooijer, J., Lechner, L., & de Vries, H. (2001). A qualitative study on detecting cancer symptoms and seeking medical help; an application of Andersen's model of total patient delay. *Patient Education and Counseling*, 42(2), 145–157. <https://doi.org/10.1016/S0738->

3991(00)00104-X

Deandrea, S., Molina-Barcelo, A., Uluturk, A., Moreno, J., Neamtii, L., Peiro-Perez, R., ...

Salas, D. (2016). Presence, characteristics and equity of access to breast cancer screening programmes in 27 European countries in 2010 and 2014. Results from an international survey. *Preventive Medicine, 91*, 250–263. <https://doi.org/10.1016/j.ypmed.2016.08.021>

DeFrank, J. T., & Brewer, N. (2010). A model of the influence of false-positive mammography screening results on subsequent screening. *Health Psychology Review, 4*(2), 112–127.

<https://doi.org/http://dx.doi.org/10.1080/17437199.2010.500482>

**Dimitrakaki, C., Boulamatsis, D., Mariolis, A., Kontodimopoulos, N., Niakas, D., &

Tountas, Y. (2009). Use of cancer screening services in Greece and associated social factors: results from the nation-wide Hellas Health I survey. *European Journal of Cancer Prevention, 18*(3), 248–257. <https://doi.org/10.1097/CEJ.0b013e32832405d6>

**Dourado, F., Carreira, H., & Lunet, N. (2013). Mammography use for breast cancer

screening in Portugal: results from the 2005/2006 National Health Survey. *European Journal of Public Health, 23*(3), 386–392. <https://doi.org/10.1093/eurpub/cks103>

Drossaert, C. H. C., Boer, H., & Seydel, E. R. (2003). Prospective study on the determinants of repeat attendance and attendance patterns in breast cancer screening using the theory of planned behaviour. *Psychology & Health, 18*(5), 551–565.

<https://doi.org/10.1080/0887044031000141207>

**Drossaert, C. H. C., Boer, H., & Seydel, E. R. (2005). Women's opinions about attending for breast cancer screening: Stability of cognitive determinants during three rounds of screening. *British Journal of Health Psychology, 10*, 133–149.

<https://doi.org/10.1348/135910704x14645>

**Dündar, P. E., Özmen, D., Öztürk, B., Haspolat, G., Akyildiz, F., Çoban, S., & Çakiroğlu, G. (2006). The knowledge and attitudes of breast self-examination and mammography in a

group of women in a rural area in western Turkey. *BMC Cancer*, 6, 1–9.

<https://doi.org/10.1186/1471-2407-6-43>

**Dundar, P., Ozyurt, B. C., & Erdurak, K. (2012). Sociodemographic determinants of nonattendance in a population-based mammography screening program in the city of Manisa, Turkey. *The scientific world journal*, 2012, 816903.

<https://doi.org/10.1100/2012/816903>

Duval, S., & Tweedie, R. (2000a). A nonparametric “trim and fill” method of accounting for publication bias in meta-analysis. *Journal of the American Statistical Association*, 95(449), 89–98. <https://doi.org/10.2307/2669529>

Duval, S., & Tweedie, R. (2000b). Trim and fill: A simple funnel-plot-based method of testing and adjusting for publication bias in meta-analysis. *Biometrics*, 56(2), 455–463.

<https://doi.org/10.1111/j.0006-341X.2000.00455.x>

Edgar, L., Glackin, M., Hughes, C., & Rogers, K. M. A. (2013). Factors influencing participation in breast cancer screening. *British Journal of Nursing*, 22(17), 1021–1026.

<https://doi.org/10.12968/bjon.2013.22.17.1021>

**Eichholzer, M., Richard, A., Rohrmann, S., Schmid, S., & Güth, U. (2016). Overweight, obesity, and breast cancer screening: Results from the 2012 Swiss Health Survey.

European Journal of Cancer Prevention, 25(2), 130–136.

<https://doi.org/10.1097/CEJ.0000000000000148>

**Eichholzer, M., Richard, A., Rohrmann, S., Schmid, S. M., Leo, C., Huang, D. J., & Güth, U. (2016). Breast cancer screening attendance in two Swiss regions dominated by opportunistic or organized screening. *BMC Health Services Research*, 16(1).

<https://doi.org/10.1186/s12913-016-1760-4>

*Eisinger, F., Viguier, J., Blay, J.-Y., Morère, J.-F., Coscas, Y., Roussel, C., & Pivot, X.

(2011). Uptake of breast cancer screening in women aged over 75 years: a controversy to

come? *European Journal Of Cancer Prevention*, 20 Suppl 1, S13–S15.

<https://doi.org/10.1097/01.cej.0000391564.03265.3f>

- **Ersin, F., Gözükar, F., Polat, P., Erçetin, G., & Bozkurt, M. E. (2015). Determining the health beliefs and breast cancer fear levels of women regarding mammography. *Turkish Journal Of Medical Sciences*, 45(4), 775–781.
- **Esteva, M., Ripoll, J., Leiva, A., Sánchez-Contador, C., & Collado, F. (2008). Determinants of non attendance to mammography program in a region with high voluntary health insurance coverage. *BMC Public Health*, 8, 1–9. <https://doi.org/10.1186/1471-2458-8-387>
- Fair, A. M., Monahan, P. O., Russell, K., Zhao, Q., & Champion, V. L. (2012). The interaction of perceived risk and benefits and the relationship to predicting mammography adherence in African American women. *Oncology Nursing Forum*, 39(1), 53–60. <https://doi.org/10.1188/12.ONF.53-60>
- Ferlay, J., Steliarova-Foucher, E., Lortet-Tieulent, J., Rosso, S., Coebergh, J. W. W., Comber, H., ... Bray, F. (2013). Cancer incidence and mortality patterns in Europe: Estimates for 40 countries in 2012. *European Journal of Cancer*, 49(6), 1374–1403. <https://doi.org/10.1016/j.ejca.2012.12.027>
- **Flamant, C., Gauthier, E., & Clavel-Chapelon, F. (2006). Determinants of non-compliance to recommendations on breast cancer screening among women participating in the French E3N cohort study. *European Journal of Cancer Prevention*, 15(1), 27–33. <https://doi.org/10.1097/01.cej.0000180666.11958.60>
- Fontana, M., & Bischoff, A. (2008). Uptake of breast cancer screening measures among immigrant and Swiss women in Switzerland. *Swiss Medical Weekly*, 138(49–50), 752–758. <https://doi.org/doi:2008/49/smw-12328>
- *Freitas, C., Tura, L. F. R., Costa, N., & Duarte, J. (2012). A population-based breast cancer screening programme: conducting a comprehensive survey to explore adherence

determinants. *European Journal Of Cancer Care*, 21(3), 349–359.

<https://doi.org/10.1111/j.1365-2354.2011.01305.x>

Fryar, C. D., Carroll, M. D., & Ogden, C. L. (2018). *Prevalence of Overweight, Obesity, and Severe Obesity Among Adults Aged 20 and Over: United States, 1960–1962 Through 2015–2016*. Retrieved from <https://wwwn.cdc.gov/nchs/nhanes/analyticguidelines.aspx>.

Giordano, L., Von Karsa, L., Tomatis, M., Majek, O., De Wolf, C., Lancucki, L., ... Ponti, A. (2012). Mammographic Screening Programmes in Europe: Organization, Coverage and Participation. *Journal of Medical Screening*, 19(1_suppl), 72–82.

<https://doi.org/10.1258/jms.2012.012085>

**Gözüm, S., & Tuzcu, A. (2018). Elapsed Time Between the First Symptoms of Breast Cancer and Medical Help-Seeking Behavior and the Affecting Factors. *Cancer Nursing*, 41(3), E21–E29. <https://doi.org/10.1097/NCC.0000000000000498>

*Griva, F., Anagnostopoulos, F., & Potamianos, G. (2013). Time perspective and perceived risk as related to mammography screening. *Women & Health*, 53(8), 761–776.

<https://doi.org/10.1080/03630242.2013.836140>

**Gulten, G., Memnun, S., Ayse, K., Aygul, A., & Gulcin, A. (2012). Breast, Cervical, and Colorectal Cancer Screening Status of a Group of Turkish Women. *Asian Pacific Journal of Cancer Prevention*, 13(9), 4273–4279. <https://doi.org/10.7314/apjcp.2012.13.9.4273>

*Gumus, A. B., Cam, O., & Malak, A. T. (2010). Socio-demographic factors and the practice of breast self examination and mammography by Turkish women. *Asian Pacific Journal Of Cancer Prevention: APJCP*, 11(1), 57–60.

Harmon, C., & Nolan, B. (2001). Health insurance and health services utilization in Ireland. *Health Economics*, 10(2), 135–145. <https://doi.org/10.1002/hec.565>

Heisey, R., Clemons, M., Granek, L., Fergus, K., Hum, S., Lord, B., ... Fitzgerald, B. (2011). Health care strategies to promote earlier presentation of symptomatic breast cancer:

perspectives of women and family physicians. *Current Oncology*, 18(5), E227–E237.

**Hellmann, S. S., Njor, S. H., Lynge, E., von Euler-Chelpin, M., Olsen, A., Tjønneland, A., ... Andersen, Z. J. (2015). Body mass index and participation in organized mammographic screening: a prospective cohort study. *BMC Cancer*, 15(1), 294. <https://doi.org/10.1186/s12885-015-1296-8>

Higgins, J. P. T., Thompson, S. G., Deeks, J. J., & Altman, D. G. (2003). Measuring inconsistency in meta-analyses. *British Medical Journal*, 327(7414), 557–560. <https://doi.org/10.1136/bmj.327.7414.557>

Hunter, M. S., Grunfeld, E. A., & Ramirez, A. J. (2003). Help-seeking intentions for breast-cancer symptoms: A comparison of the self-regulation model and the theory of planned behaviour. *British Journal of Health Psychology*, 8, 319–333. <https://doi.org/10.1348/135910703322370888>

**Innos, K., Padrik, P., Valvere, V., Eelma, E., Kütner, R., Lehtsaar, J., & Tekkel, M. (2013). Identifying women at risk for delayed presentation of breast cancer: a cross-sectional study in Estonia. *BMC Public Health*, 13, 947. <https://doi.org/10.1186/1471-2458-13-947>

**Jassem, J., Ozmen, V., Bacanu, F., Drobniene, M., Eglitis, J., Lakshmaiah, K. C., ... Zaborek, P. (2014). Delays in diagnosis and treatment of breast cancer: a multinational analysis. *European Journal of Public Health*, 24(5), 761–767. <https://doi.org/10.1093/eurpub/ckt131>

*Jensen, L. F., Pedersen, A. F., Andersen, B., & Vedsted, P. (2015). Self-assessed health, perceived stress and non-participation in breast cancer screening: A Danish cohort study. *Preventive Medicine*, 81, 392–398. <https://doi.org/10.1016/J.YPMED.2015.10.004>

Jerome-D’Emilia, B. (2015). A Systematic Review of Barriers and Facilitators to Mammography in Hispanic Women. *Journal of Transcultural Nursing*, 26(1), 73–82. <https://doi.org/10.1177/1043659614530761>

Khazir, Sharifabad, M. A. M., Vaezi, A. A., Enjezab, B., Fallahzadeh, H., & Yari, F. (2019). Predictors of mammography based on Health Belief Model in Khorramabad women. *Journal of Education and Health Promotion, 8*(1), 180.

https://doi.org/10.4103/JEHP.JEHP_63_19

Kmet, L. M., Lee, R. C., & Cook, L. S. (2004). Standard quality assessment criteria for evaluating primary research papers from a variety of fields. *AHFMR, HTA Initiative, 13*, 1–21.

**Koo, M. M., von Wagner, C., Abel, G. A., McPhail, S., Rubin, G. P., & Lyratzopoulos, G. (2017). Typical and atypical presenting symptoms of breast cancer and their associations with diagnostic intervals: Evidence from a national audit of cancer diagnosis. *Cancer Epidemiology, 48*, 140–146. <https://doi.org/10.1016/J.CANEP.2017.04.010>

*Kristiansen, M., Thorsted, B. L., Krasnik, A., & von Euler-Chelpin, M. (2012). Participation in mammography screening among migrants and non-migrants in Denmark. *Acta Oncologica, 51*(1), 28–36. <https://doi.org/10.3109/0284186x.2011.626447>

*Labeit, A., Peinemann, F., & Baker, R. (2013). Utilisation of preventative health check-ups in the UK: Findings from individual-level repeated cross-sectional data from 1992 to 2008. *BMJ Open, 3*(12). <https://doi.org/http://dx.doi.org/10.1136/bmjopen-2013-003387>

**Lagerlund, M., Drake, I., Wirfält, E., Sontrop, J. M., & Zackrisson, S. (2015). Health-related lifestyle factors and mammography screening attendance in a Swedish cohort study. *European Journal of Cancer Prevention, 24*(1), 44–50. <https://doi.org/10.1097/CEJ.0000000000000025>

Larsen, S. H., Virgilsen, L. F., Kristiansen, B. K., Andersen, B., & Vedsted, P. (2018). Strong association between cervical and breast cancer screening behaviour among Danish women; A register-based cohort study. *Preventive Medicine Reports, 12*, 349–354. <https://doi.org/10.1016/J.PMEDR.2018.10.017>

- Leventhal, H., Brisette, I., & Leventhal, E. A. (2003). The common-sense model of self-regulation of health and illness. In L. Cameron & H. Leventhal (Eds.), *The self-regulation of health and illness behaviour* (pp. 42–65). New York, New York: Routledge.
- Liberati, A., Altman, D. G., Tetzlaff, J., Mulrow, C., Gotzsche, P. C., Ioannidis, J. P. A., ... Moher, D. (2009). The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate healthcare interventions: explanation and elaboration. *Bmj-British Medical Journal*, *339*. <https://doi.org/10.1136/bmj.b2700>
- **López-de-Andrés, A., Martín-Lopez, R., Hernández-Barrera, V., Carrasco-Garrido, P., Gil-de-Miguel, A., Esteban, y P., & Jiménez-García, R. (2010). Predictors of breast and cervical cancer screening in a Spanish metropolitan area. *Journal Of Women's Health* (2002), *19*(9), 1675–1681. <https://doi.org/10.1089/jwh.2009.1828>
- Maghous, A., Rais, F., Ahid, S., Benhmidou, N., Bellahamou, K., Loughlimi, H., ... Benjaafar, N. (2016). Factors influencing diagnosis delay of advanced breast cancer in Moroccan women. *BMC Cancer*, *16*, 356. <https://doi.org/10.1186/s12885-016-2394-y>
- **Marmarà, D., Marmarà, V., & Hubbard, G. (2017). Health beliefs, illness perceptions and determinants of breast screening uptake in Malta: A cross-sectional survey. *BMC Public Health*, *17*(1). <https://doi.org/10.1186/s12889-017-4324-6>
- Marmot, M. G., Altman, D. G., Cameron, D. A., Dewar, J. A., Thompson, S. G., Wilcox, M., & Independent, U. K. P. B. C. S. (2013). The benefits and harms of breast cancer screening: an independent review. *British Journal of Cancer*, *108*(11), 2205–2240. <https://doi.org/10.1038/bjc.2013.177>
- **Martín-López, R., Hernández-Barrera, V., Lopez-de-Andres, A., Carrasco- Garrido, P., Gil De Miguel, A., & Jiminez García, R. (2010). Breast and cervical cancer screening in Spain and predictors of adherence. *European Journal Of Cancer Prevention*, *19*(3), 239–245. <https://doi.org/10.1097/CEJ.0b013e3283372125>

- **Martín-López, R., Jiménez-García, R., Lopez-de-Andres, A., Hernández-Barrera, V., Jiménez-Trujillo, I., Gil-de-Miguel, A., & Carrasco-Garrido, P. (2013). Inequalities in uptake of breast cancer screening in Spain: analysis of a cross-sectional national survey. *Public Health*, *127*(9), 822–827. <https://doi.org/10.1016/j.puhe.2013.03.006>
- Maruthur, N. M., Bolen, S., Brancati, F. L., & Clark, J. M. (2009). Obesity and Mammography: A Systematic Review and Meta-Analysis. *Journal of General Internal Medicine*, *24*(5), 665–677. <https://doi.org/10.1007/s11606-009-0939-3>
- McCann, J., Stockton, D., & Godward, S. (2002). Impact of false-positive mammography on subsequent screening attendance and risk of cancer. *Breast Cancer Research : BCR*, *4*(5), R11–R11. <https://doi.org/10.1186/bcr455>
- McGuigan, R. D., & Wilkinson, J. M. (2015). Obesity and Healthcare Avoidance: A Systematic Review. *Aimsph 2015, Vol. 2, Pages 56-63*. <https://doi.org/10.3934/publichealth.2015.1.56>
- McLeroy, K. R., Bibeau, D., Steckler, A., & Glanz, K. (1988). An Ecological Perspective on Health Promotion Programs. *Health Education Quarterly*, *15*(4), 351–377. <https://doi.org/10.1177/109019818801500401>
- McMaster, C., & Lee, C. (1991). Cognitive dissonance in tobacco smokers. *Addictive Behaviors*, *16*(5), 349–353. [https://doi.org/10.1016/0306-4603\(91\)90028-g](https://doi.org/10.1016/0306-4603(91)90028-g)
- **Menvielle, G., Richard, J.-B., Ringa, V., Dray-Spira, R., & Beck, F. (2014). To what extent is women's economic situation associated with cancer screening uptake when nationwide screening exists? A study of breast and cervical cancer screening in France in 2010. *Cancer Causes & Control: CCC*, *25*(8), 977–983. <https://doi.org/10.1007/s10552-014-0397-z>
- Messina, C. R., Kabat, G. C., & Lane, D. S. (2002). Perceptions of risk factors for breast cancer and attitudes toward mammography among women who are current, ex- and non-

smokers. *Women & Health*, 36(3), 65–82. https://doi.org/10.1300/J013v36n03_05

**Naoum, P., Skroumpelos, A., Athanasakis, K., & Kyriopoulos, J. (2018). Factors associated with the utilization of mammographic screening in Greece. *European Journal of Cancer Prevention*, 27(1), 13–19. <https://doi.org/10.1097/CEJ.0000000000000280>

National Cancer Intelligence Network (NCIN). (2013). Routes to diagnosis. Retrieved from http://www.ncin.org.uk/publications/routes_to_diagnosis

NHS Digital. (2019). Breast Screening Programme, England 2017-18 [NS] [PAS] - NHS Digital. Retrieved September 11, 2019, from <https://digital.nhs.uk/data-and-information/publications/statistical/breast-screening-programme/england-2017-18>

Nightingale, J. M., Borgen, R., Porter-Bennett, L., & Szczepura, K. (2015). An audit to investigate the impact of false positive breast screening results and diagnostic work-up on re-engagement with subsequent routine screening. *Radiography*, 21(1), 7–10.

<https://doi.org/10.1016/J.RADI.2014.05.005>

**O’Mahony, M., & Hegarty, J. (2009). Factors influencing women in seeking help from a health care professional on self discovery of a breast symptom, in an Irish context. *Journal of Clinical Nursing*, 18(14), 2020–2029. <https://doi.org/10.1111/j.1365-2702.2008.02564.x>

**O’Mahony, M., McCarthy, G., Corcoran, P., & Hegarty, J. (2013). Shedding light on women’s help seeking behaviour for self discovered breast symptoms. *European Journal of Oncology Nursing*, 17(5), 632–639. <https://doi.org/10.1016/j.ejon.2013.03.012>

Ornstein, S. M., Jenkins, R. G., Litvin, C. B., Wessell, A. M., & Nietert, P. J. (2013).

Preventive services delivery in patients with chronic illnesses: parallel opportunities rather than competing obligations. *Annals of Family Medicine*, 11(4), 344–349.

<https://doi.org/10.1370/afm.1502>

**Ozmen, V., Nilufer Ozaydin, A., Cabioglu, N., Gulluoglu, B. M., Unalan, P. C., Gorpe, S.,

- ... Anderson, B. O. (2011). Survey on a mammographic screening program in Istanbul, Turkey. *The Breast Journal*, *17*(3), 260–267. <https://doi.org/10.1111/j.1524-4741.2011.01065.x>
- Painter, J. E., Borba, C. P. C., Hynes, M., Mays, D., & Glanz, K. (2008). The use of theory in health behavior research from 2000 to 2005: a systematic review. *Annals of Behavioral Medicine : A Publication of the Society of Behavioral Medicine*, *35*(3), 358–362. <https://doi.org/10.1007/s12160-008-9042-y>
- *Pivot, X., Rixe, O., Morere, J. F., Coscas, Y., Cals, L., Namer, M., ... Blay, J. Y. (2008). Breast cancer screening in France: Results of the EDIFICE survey. *International Journal of Medical Sciences*, *5*(3), 106–112. <https://doi.org/10.7150/ijms.5.106>
- *Pons-Vigués, M., Puigpinós-Riera, R., Rodríguez-Sanz, M., Serral, G., Palència, L., & Borrell, C. (2011). Preventive control of breast and cervical cancer in immigrant and native women in Spain: the role of country of origin and social class. *International Journal Of Health Services: Planning, Administration, Evaluation*, *41*(3), 483–499. <https://doi.org/doi:10.2190/HS.41.3.e>
- **Pons-Vigués, M., Puigpinós-Riera, R., Serral, G., Pasarín, M. I., Rodríguez, D., Pérez, G., ... Borrell, C. (2012). Knowledge, attitude and perceptions of breast cancer screening among native and immigrant women in Barcelona, Spain. *Psycho-Oncology*, *21*(6), 618–629. <https://doi.org/10.1002/pon.1940>
- *Pornet, C., Dejardin, O., Morlais, F., Bouvier, V., & Launoy, G. (2010). Socioeconomic and healthcare supply statistical determinants of compliance to mammography screening programs: a multilevel analysis in Calvados, France. *Cancer Epidemiology*, *34*(3), 309–315. <https://doi.org/10.1016/j.canep.2010.03.010>
- Public Health England. (2015a). Breast screening: programme overview. Retrieved October 9, 2019, from <https://www.gov.uk/guidance/breast-screening-programme->

overview#screeningage

Public Health England. (2015b). Cervical screening: programme overview. Retrieved October 9, 2019, from <https://www.gov.uk/guidance/cervical-screening-programme-overview>

Quaife, S. L., McEwen, A., Janes, S. M., & Wardle, J. (2015). Smoking is associated with pessimistic and avoidant beliefs about cancer: results from the International Cancer Benchmarking Partnership. *British Journal of Cancer*, *112*(11), 1799–1804. <https://doi.org/10.1038/bjc.2015.148>

Ramirez, A. J., Westcombe, A. M., Burgess, C. C., Sutton, S., Littlejohns, P., & Richards, M. A. (1999). Factors predicting delayed presentation of symptomatic breast cancer: a systematic review. *Lancet*, *353*(9159), 1127–1131. [https://doi.org/10.1016/s0140-6736\(99\)02142-x](https://doi.org/10.1016/s0140-6736(99)02142-x)

Renzi, C., Whitaker, K. L., & Wardle, J. (2015). Over-reassurance and undersupport after a “false alarm”: a systematic review of the impact on subsequent cancer symptom attribution and help seeking. *Bmj Open*, *5*(2). <https://doi.org/10.1136/bmjopen-2014-007002>

Renzi, C., Whitaker, K. L., Winstanley, K., Cromme, S., & Wardle, J. (2016). Unintended consequences of an “all-clear” diagnosis for potential cancer symptoms: a nested qualitative interview study with primary care patients. *British Journal of General Practice*, *66*(644), E158–E170. <https://doi.org/10.3399/bjgp16X683845>

**Ricardo-Rodrigues, I., Jiménez-García, R., Hernández-Barrera, V., Carrasco-Garrido, P., Jiménez-Trujillo, I., & de Andrés, A. L. (2015). Social disparities in access to breast and cervical cancer screening by women living in Spain. *Public Health*, *129*(7), 881–888. <https://doi.org/10.1016/j.puhe.2015.02.021>

Richards, M. A., Westcombe, A. M., Love, S. B., Littlejohns, P., & Ramirez, A. J. (1999). Influence of delay on survival in patients with breast cancer: a systematic review. *Lancet*,

353(9159), 1119–1126. [https://doi.org/10.1016/s0140-6736\(99\)02143-1](https://doi.org/10.1016/s0140-6736(99)02143-1)

Rogers, R. W. (1975). A Protection Motivation Theory of Fear Appeals and Attitude Change.

The Journal of Psychology, *91*(1), 93–114.

<https://doi.org/10.1080/00223980.1975.9915803>

Rosenstock, I. M. (1974). Historical Origins of the Health Belief Model. *Health Education*

Monographs, *2*(4), 328–335. <https://doi.org/10.1177/109019817400200403>

Ruddy, K. J., Gelber, S., Tamimi, R. M., Schapira, L., Come, S. E., Meyer, M. E., ... Partridge,

A. H. (2014). Breast Cancer Presentation and Diagnostic Delays in Young Women.

Cancer, *120*(1), 20–25. <https://doi.org/10.1002/cncr.28287>

*Sadikoglu, G., Ozcakil, A., Dogan, F., Gokgoz, S., & Bilgel, N. (2010). Mammography utilization among Turkish women. *Asian Pacific Journal Of Cancer Prevention: APJCP*, *11*(2), 377–381.

**Sanz-Barbero, B., Sopacua, M., Otero-Garcia, L., Borda-Olivas, A., & Zunzunegui, M. V. (2012). Inequalities in the use of mammography in Spain: effect of caring for disabled family. *International Journal of Public Health*, *57*(6), 953–957.

<https://doi.org/10.1007/s00038-012-0395-4>

**Schoofs, J., Krijger, K., Vandevoorde, J., & Devroey, D. (2017). Health-related Factors Associated with Adherence to Breast Cancer Screening. *Journal of Mid-Life Health*, *8*(2), 63–69. https://doi.org/10.4103/jmh.JMH_71_15

Schueler, K. M., Chu, P. W., & Smith-Bindman, R. (2008). Factors Associated with Mammography Utilization: A Systematic Quantitative Review of the Literature. *Journal of Womens Health*, *17*(9), 1477–1498. <https://doi.org/10.1089/jwh.2007.0603>

**Secginli, S., & Nahcivan, N. O. (2006). Factors associated with breast cancer screening behaviours in a sample of Turkish women: A questionnaire survey. *International Journal of Nursing Studies*, *43*(2), 161–171. <https://doi.org/10.1016/j.ijnurstu.2005.02.004>

- **Sicsic, J., & Franc, C. (2014). Obstacles to the uptake of breast, cervical, and colorectal cancer screenings: what remains to be achieved by French national programmes? *BMC Health Services Research*, *14*, 465. <https://doi.org/10.1186/1472-6963-14-465>
- Smith, L. K., Pope, C., & Botha, J. L. (2005). Patients' help-seeking experiences and delay in cancer presentation: A qualitative synthesis. *Lancet*, *366*(9488), 825–831. [https://doi.org/10.1016/S0140-6736\(05\)67030-4](https://doi.org/10.1016/S0140-6736(05)67030-4)
- Solbjør, M., Skolbekken, J.-A., Sætnan, A. R., Hagen, A. I., & Forsmo, S. (2012). Could screening participation bias symptom interpretation? An interview study on women's interpretations of and responses to cancer symptoms between mammography screening rounds. *BMJ Open*, *2*(6), e001508. <https://doi.org/10.1136/bmjopen-2012-001508>
- *Sözmen, K., Unal, B., Sakarya, S., Dinc, G., Yardim, N., Keskinilic, B., & Ergör, G. (2016). Determinants of Breast and Cervical Cancer Screening Uptake among Women in Turkey. *Asia-Pacific Journal of Public Health*, *28*(6), 528–538. <https://doi.org/10.1177/1010539516654541>
- Spahlholz, J., Baer, N., König, H.-H., Riedel-Heller, S. G., & Luck-Sikorski, C. (2016). Obesity and discrimination - a systematic review and meta-analysis of observational studies. *Obesity Reviews*, *17*(1), 43–55. <https://doi.org/10.1111/obr.12343>
- *Stamatovic, L., Vasovic, S., Trifunovic, J., Boskov, N., Gajic, Z., Parezanovic, A., ... Milic, N. (2018). Factors influencing time to seeking medical advice and onset of treatment in women who are diagnosed with breast cancer in Serbia. *Psycho-Oncology*, *27*(2), 576–582. <https://doi.org/10.1002/pon.4551>
- Szczepura, A., Price, C., & Gumber, A. (2008). Breast and bowel cancer screening uptake patterns over 15 years for UK south Asian ethnic minority populations, corrected for differences in socio-demographic characteristics. *Bmc Public Health*, *8*. <https://doi.org/10.1186/1471-2458-8-346>

- *Taylor-Phillips, S., O'Sullivan, E., Kearins, O., Parsons, H., & Clarke, A. (2013). The effects of a UK review of Breast Cancer Screening on Uptake: an observational before/after study. *Journal of Medical Screening*, *20*(2), 86–90.
<https://doi.org/10.1177/0969141313497198>
- **Tekkel, M., Veideman, T., & Rahu, M. (2011). Use of mammography, Pap test and prostate examination by body mass index during the developmental period of cancer screening in Estonia. *Public Health*, *125*(10), 697–703. <https://doi.org/10.1016/j.puhe.2011.06.013>
- *Vogt, V., Siegel, M., & Sundmacher, L. (2014). Examining regional variation in the use of cancer screening in Germany. *Social Science & Medicine* (1982), *110*, 74–80.
<https://doi.org/10.1016/j.socscimed.2014.03.033>
- *Walsh, B., Silles, M., & O'Neill, C. (2012). The role of private medical insurance in socio-economic inequalities in cancer screening uptake in Ireland. *Health Economics*, *21*(10), 1250–1256. <https://doi.org/10.1002/hec.1784>
- Wang, W.-L., Hsu, S.-D., Wang, J.-H., Huang, L.-C., & Hsu, W.-L. (2014). Survey of breast cancer mammography screening behaviors in Eastern Taiwan based on a health belief model. *The Kaohsiung Journal of Medical Sciences*, *30*(8), 422–427.
<https://doi.org/10.1016/J.KJMS.2014.04.007>
- Webb, T. L., Joseph, J., Yardley, L., & Michie, S. (2010). Using the Internet to Promote Health Behavior Change: A Systematic Review and Meta-analysis of the Impact of Theoretical Basis, Use of Behavior Change Techniques, and Mode of Delivery on Efficacy. *Journal of Medical Internet Research*, *12*(1), e4. <https://doi.org/10.2196/jmir.1376>
- World Health Organization (WHO). (2011). Global status report on noncommunicable diseases 2010: Description of the global burden of NCDs, their risk factors and determinants.
Retrieved from http://www.who.int/nmh/publications/ncd_report2010/en/
- World Health Organization (WHO). (2016). Obesity and overweight. Retrieved from

<http://www.who.int/mediacentre/factsheets/fs311/en/>

Witte, K. (1992). Putting the fear back into fear appeals. *Communications Monographs*, 59(4), 329–349. Retrieved from <https://www.msu.edu/~wittek/fearback.htm>

Witte, K., Cameron, K. A., McKeon, J. K., & Berkowitz, J. M. (1996). Predicting risk behaviors: Development and validation of a diagnostic scale. *Journal of Health Communication*, 1(4), 317–341. <https://doi.org/10.1080/108107396127988>

Yarbrough, S. S., & Braden, C. J. (2001). Utility of health belief model as a guide for explaining or predicting breast cancer screening behaviours. *Journal of Advanced Nursing*, 33(5), 677–688. <https://doi.org/10.1046/j.1365-2648.2001.01699.x>

**Yilmaz, D., Bebis, H., & Ortabag, T. (2013). Determining the awareness of and compliance with breast cancer screening among Turkish residential women. *Asian Pacific Journal Of Cancer Prevention: APJCP*, 14(5), 3281–3288.

**Yilmaz, M., Guler, G., Bekar, M., & Guler, N. (2011). Risk of breast cancer, health beliefs and screening behaviour among Turkish academic women and housewives. *Asian Pacific Journal Of Cancer Prevention: APJCP*, 12(3), 817–822.

**Zafer, E., Tanrıkulu, P., Atakul, T., Ömürlü, I. K., & Yüksel, H. (2017). Status and awareness of cervical, breast, and colon cancer screening in a Turkish city. *European Journal of Gynaecological Oncology*, 38(3), 391–397.

<https://doi.org/doi:10.12892/ejgo3584.2017>

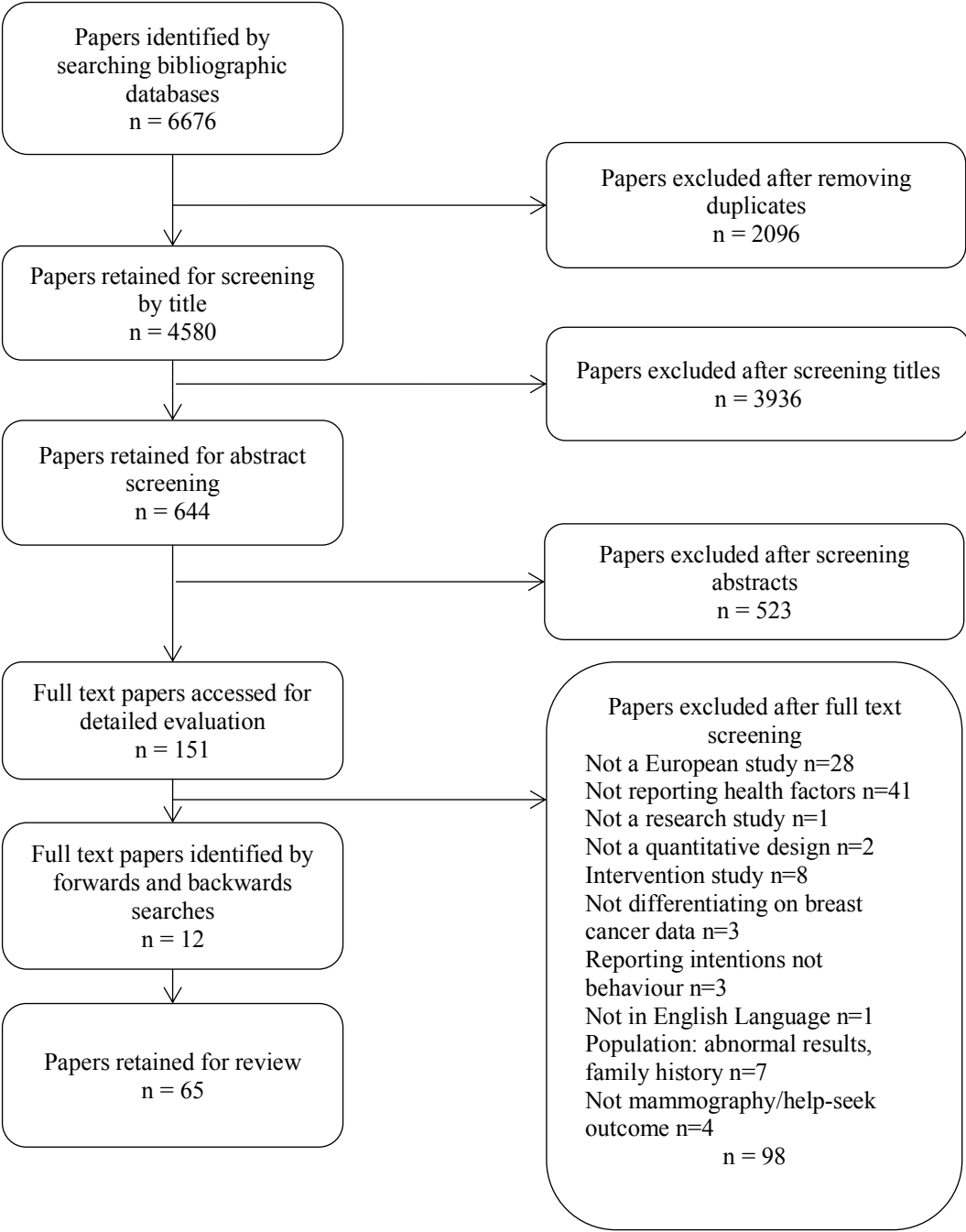


Figure 1. Flow diagram of search

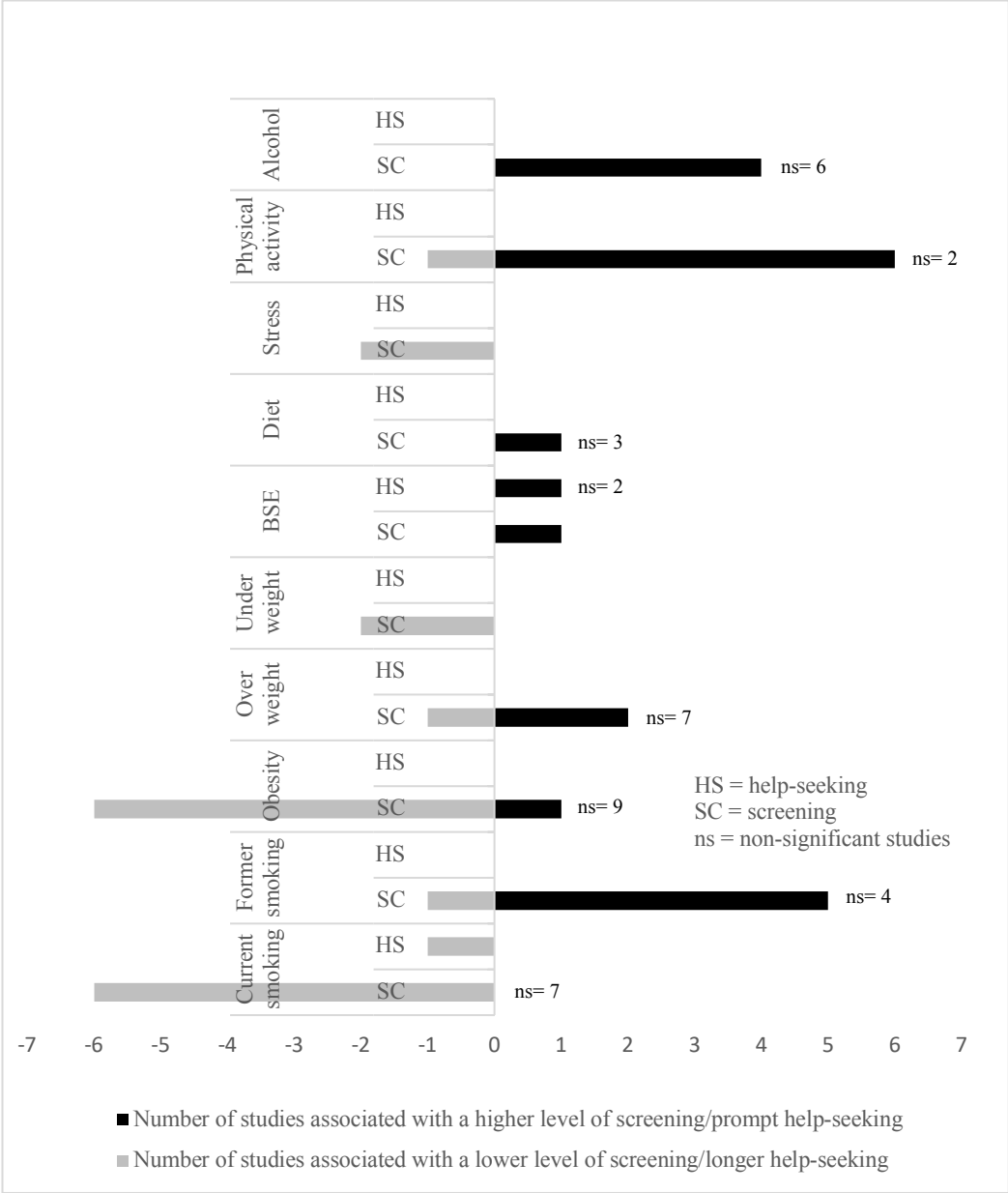


Figure 2. Health behaviours associated with breast screening and help-seeking behaviour

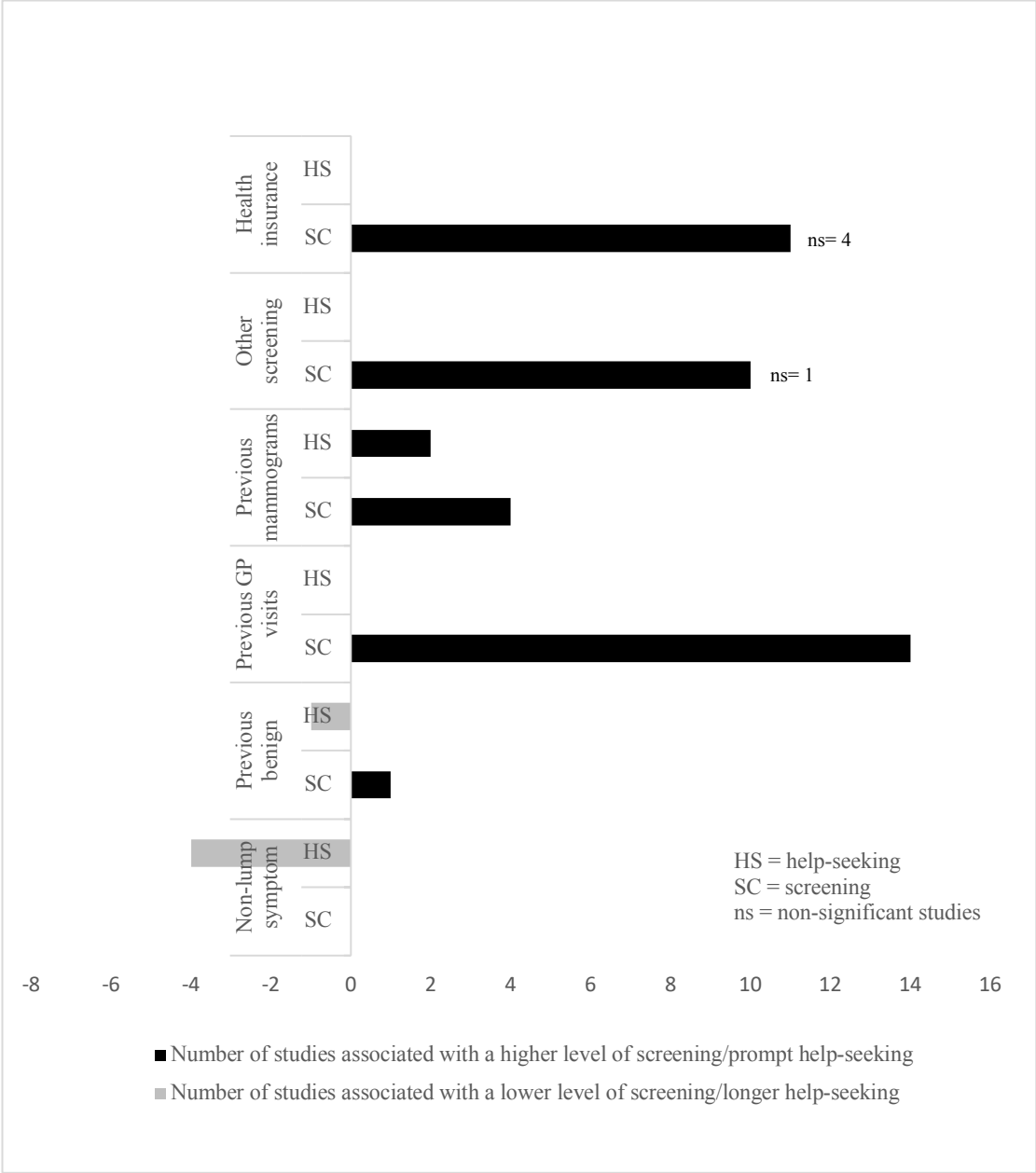


Figure 3. Healthcare utilisation and previous experience associated with breast screening and help-seeking behaviour

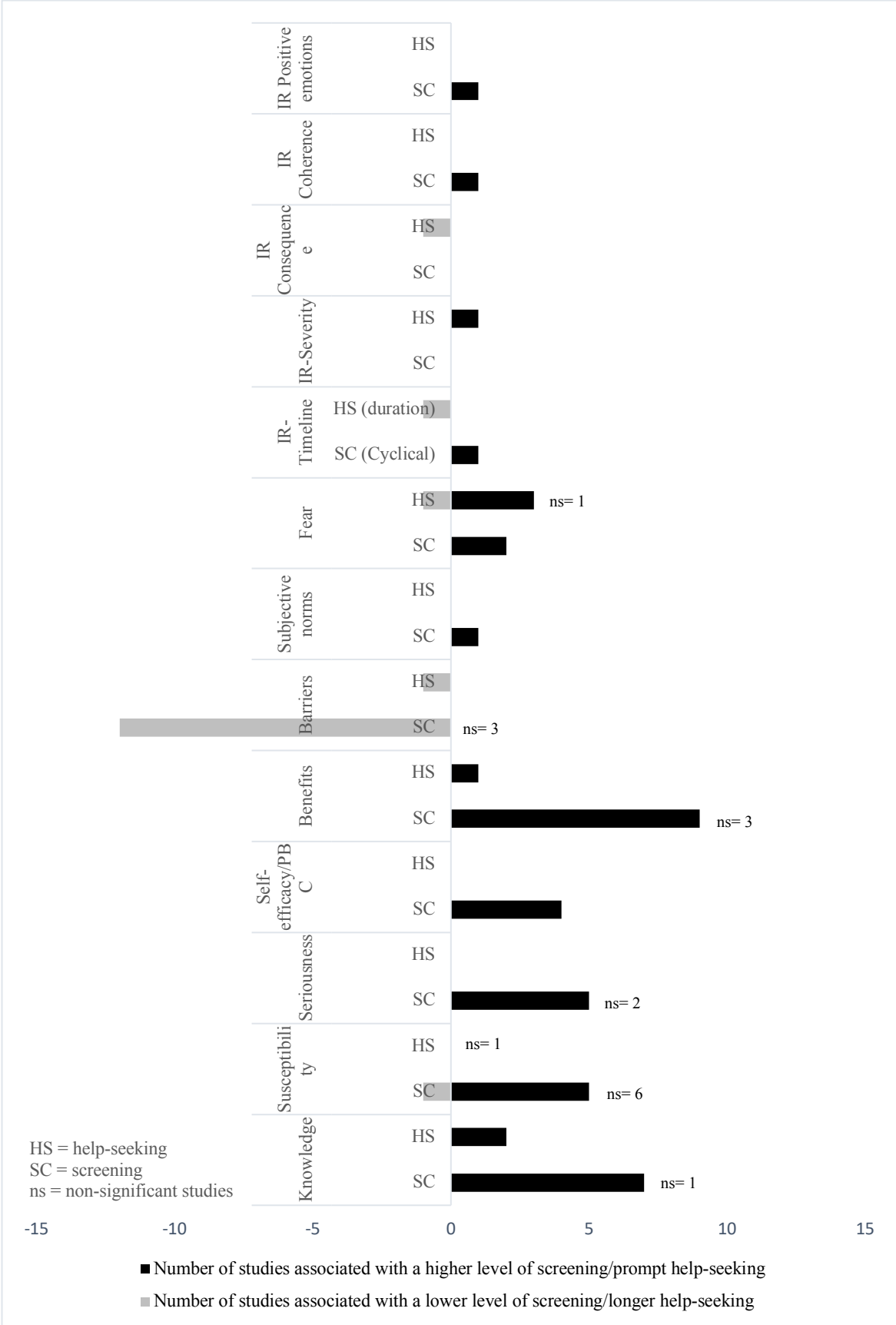


Figure 4. Knowledge and beliefs associated with breast screening and help-seeking behaviour