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Title:

Barriers and Facilitators to Health Screening in Men: A Systematic Review

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Abstract:

Rationale. Men have poorer health status and are less likely to attend health screening compared to women.

Objective. This systematic review presents current evidence on the barriers and facilitators to engaging men in health screening.

Methods. We included qualitative, quantitative and mixed-method studies identified through five electronic databases, contact with experts and reference mining. Two researchers selected and appraised the studies independently. Data extraction and synthesis were conducted using the 'best fit' framework synthesis method.

Results. 53 qualitative, 44 quantitative and 6 mixed-method studies were included. Factors influencing health screening uptake in men can be categorized into five domains: individual, social, health system, healthcare professional and screening procedure. The most commonly reported barriers are fear of getting the disease and low risk perception; for facilitators, they are perceived risk and benefits of screening. Male-dominant barriers include heterosexual - self-presentation, avoidance of femininity and lack of time. The partner's role is the most common male-dominant facilitator to screening.

Conclusions. This systematic review provides a comprehensive overview of barriers and facilitators to health screening in men including the male-dominant factors. The findings are

particularly useful for clinicians, researchers and policy makers who are developing interventions and policies to increase screening uptake in men.

Keywords:

Systematic review, screening, barrier, facilitator, men's health, masculinity, qualitative, quantitative

Highlights:

- Health screening uptake in men is influenced by widely varying factors.
- Commonly reported barriers include fear of getting the disease and low risk perception.
- Commonly reported facilitators include perceived at risk and benefits of screening.
- Male-dominant barriers include heterosexual self-presentation and to avoid femininity.
- Partner's role is the most commonly reported male-dominant facilitator to screening.

Introduction

Globally, men do not live as long as women (Barford et al., 2006; WHO, 2011) and have higher mortality and morbidity rates across most of the diseases (AIHW, 2013; Bilsker et al., 2010; EC, 2011; Ng et al., 2014; White et al., 2011a). Possible explanations include men's poor health seeking behavior, lack of health knowledge, risk taking behavior as well as their reluctance to engage in health promotion activities (Addis & Mahalik, 2003; Byrnes et al., 1999; Courtenay, 2003).

Various strategies can be used to improve the status of men's health, particularly health screening. Through health screening, one can identify a disease at the early stage allowing intervention before the disease worsens. For instance, a study on the impact of cardiovascular disease (CVD) screening reported that screening attenders have lower CVD mortality rate, all-cause mortality rate, healthcare utilization and cost compared to non-attenders (Lee et al., 2015). A one percent reduction of cardiovascular events through a preventive program across England and Wales has the potential to save at least £30 million of health services cost per year (Barton et al., 2011). Similarly, screening for colorectal cancer using faecal occult blood test (FOBT) was reported to decrease the relative risk of colorectal cancer death by 15-20%, save 3.8-8.29 quality adjusted life days per person and £1,890-£2,576 of healthcare cost per life year (Hewitson et al., 2007; Tappenden et al., 2004).

In spite of all the benefits of screening, screening uptake is low, particularly in men. The uptake rates of guaiac-based faecal occult blood (gFOB) test in the UK Bowel Cancer Screening Programme were lower in men across all three rounds of the biennial invitation (first round: men 53.3% vs women 61.3%; second round: men 58.0% vs women 63.7%; third round: men 64.1% vs women 68.2%) (Lo et al., 2015). Another study on screening uptake in Ontario showed a similar pattern where the uptake of screening was lower in men for

colorectal cancer (men 55.1% vs women 61.6%), diabetes (men 61.4% vs women 72.9%) and cholesterol (men 70.3% vs women 82.4%) (Borkhoff et al., 2013). A narrative scoping review on socio-determinants of screening uptake cites nine studies that indicated men were less likely to engage health screening compared to women, particularly men who are less educated, unemployed and from low socio-economic status (Dryden et al., 2012). However, this review did not provide reasons for the low screening uptake in men.

For a screening intervention to be effective, it is important that it is tailored to the characteristics of the population, such as using a gendered approach. Masculinity attributes like avoidance of femininity, toughness and risk taking have been used to explain the difference in health screening behavior between men and women (Connell, 1987, 1995). The Madrid Statement, released by the World Health Organization (WHO) in 2001, clearly states that health policies must recognize that men and women have different needs, obstacles and opportunities in order to attain the highest standard of health (WHO, 2001). Experts have argued the importance of considering gender when developing interventions, programs and policies in recognition that men and women behave differently (Baker et al., 2014; Banks, 2004; Weller & Campbell, 2009; White et al., 2011b).

This systematic review thus aims to review the existing evidence on the barriers and facilitators to engaging men in health screening. We sought to identify the most commonly reported barriers and facilitators to health screening along with those barriers and facilitators that are particularly prominent in a male population (male-dominant). We hope that identification of these factors will help in the development of effective interventions to overcome these barriers and improve screening uptake in men. However, this review did not include studies focusing on certain male populations, such as gay and aboriginal men, as there are unique factors that influence their health screening behavior which deserve separate reviews.

Methods

Eligibility Criteria

We included qualitative, quantitative and mixed-method studies that identified men's barriers or facilitators in engaging with health screening. For inclusion, a study must clearly differentiate the barriers or facilitators between men and women. Informants could include men or women patients or healthcare professionals as long as the barriers or facilitators discussed are those for male patients. Studies included in the review investigate men who have attended for screening, as well as non-attenders. Participants could be derived from any age group and they must be asymptomatic of the disease for the screening planned in each study. We excluded studies that focused on men who were gene carriers, prisoners, disabled, drug users, in military service, homeless, immigrants, refugees as well as aboriginal and gay men. These groups of men face additional barriers when seeking healthcare and they deserve separate reviews.

We included all types of screening recommended by the United States Preventive Services Task Force (USPSTF) as well as male-specific diseases like prostate and testicular cancer screening (United States Preventive Services Task Force, 2016). We included studies on prostate cancer screening conducted before 2012 as USPSTF recommended against prostate cancer screening after that. Studies of barriers or facilitators of screening carried out as a part of a screening program were also included in this review. We excluded genetic tests for prostate cancer and studies that focus on screening at the emergency department. Studies that used an intervention to increase screening uptake, looked solely at socio-demographic determinants or focused on physicians' screening practices were also excluded from this review.

Information Sources and Search

We searched five key databases (PubMed, Embase, CINAHL via EBSCOHost, PsycINFO via OvidSP and Web of Science) up to 23 October 2014 to identify relevant articles. We combined three main concepts (men, screening, barrier/facilitator) and a methodological filter (qualitative/survey) using keywords and subject headings from respective databases in the search. The search strategy can be found in Appendix A. We only included articles published in English. Apart from database searching, we also sourced relevant articles from men's health experts and followed up references in eligible articles.

Study Selection and Appraisal

Two researchers performed all phases of study sifting and selection independently, including screening of titles, abstracts and full-texts. In cases of doubt, the researchers were encouraged to be inclusive. Any discrepancies were resolved through discussion and consensus. All the included studies were appraised using the Mixed-Method Appraisal Tool (MMAT) which allows appraisal of the validity, reliability and generalizability of the quantitative, qualitative and mixed-method studies (Appendix B) (Pluye et al., 2011). It can also be used quickly and reliably (Pace et al., 2012). For mixed-method studies, both qualitative and quantitative components of the studies were appraised. The appraisal was conducted to report the quality of the studies and not used as a threshold for selecting studies for inclusion.

Data Extraction and Synthesis

Data extraction and synthesis were conducted based on the 'best fit' framework synthesis method which provides 'a means to test, reinforce and build on an existing published model, conceived for a potentially different but relevant population' (Carroll et al., 2013). Researchers can combine several frameworks if necessary and refine the framework by adding new themes that emerged from the data, which are not found in the initial framework.

We first identified a framework on the barriers and facilitators to screening from the studies included in this review (Garcia-Dominic et al., 2012), supplemented by two other frameworks by Christy et al and Denberg et al, which focused on masculinity (avoidance of femininity, self-reliance, risk taking and heterosexual self-presentation) and screening procedure respectively, to form a more comprehensive meta-framework (Christy et al., 2014; Denberg et al., 2005). This meta-framework was then pilot tested by two researchers against ten studies before the final framework was decided.

Two researchers extracted the data from each included paper and coded them deductively using the meta-framework. Data that could not fit the meta-framework were coded separately under a new theme in a subsequent inductive phase. Data that were unclear or without sufficient explanation were excluded from the analysis.

Once data from all studies were extracted, the researchers compared the coding, discussed and resolved any discrepancy through consensus. The themes from the meta-framework and the newly generated themes were combined using the thematic approach to produce the final framework of barriers and facilitators to health screening in men. The analysis including the quotations can be obtained from the researchers upon request.

Additional Analysis

Besides aiming to develop the comprehensive framework of barriers and facilitators to health screening in men, we also sought to find out which are the most common barriers or facilitators by counting the number of studies that reported a barrier or facilitator and ranking them accordingly.

In addition, we sought to identify the barriers and facilitators that are found predominantly in men, using to two methods. For qualitative studies (53 qualitative paper plus qualitative components of 4 mixed-method papers), criteria for deciding male-dominant barriers and facilitators in men appear in Appendix C. For quantitative studies, barriers and facilitators were considered male-dominant when there were significantly higher percentage of barriers or facilitators reported by men compared to women, with $p < .05$.

Results

Included Studies' Characteristics

We identified 14322 articles from five databases, contact with experts and follow up of references (excluding duplicates and non-journal articles) (Fig. 1). We eventually included 103 studies in the review which consisted of 53 qualitative, 44 quantitative and 6 mixed-method studies. In four out of six mixed-method studies, only the qualitative component of the study was included as the quantitative component did not meet our inclusion criteria. In the other two mixed-method studies both qualitative and quantitative components of the study were included in the analysis.

[INSERT FIGURE 1 ABOUT HERE]

The characteristics of all studies and their references are presented in Appendix D. The studies were conducted from 1985 to 2012 and in North America (k=62), Europe (k=14),

Africa (*k*=9), Oceania (*k*=8), Asia (*k*=6) and South America (*k*=4). Most of the studies were conducted in the community (*k*=70); few in the healthcare setting (*k*=19); and a small number in both settings (*k*=3). All included quantitative studies were cross-sectional studies. Most qualitative studies (*k*=53) did not report their study design and the most commonly reported study designs were grounded theory (*k*=3), phenomenology (*k*=2) and ethnography (*k*=1). More than half of the included studies (*k*=65) did not report using a theory in their study. Of those reported, the Health Belief Model (*k*=16) was the most commonly used theory (Champion VL, 2008).

Among the included studies, the most commonly studied screening topics were prostate cancer (*k*=40), colorectal cancer (*k*=33) and HIV (*k*=15) and the remainder included sexually transmitted disease (*k*=4), cancer (*k*=4), testicular cancer (*k*=3), cardiovascular disease (*k*=2), skin cancer (*k*=1) and multiphasic examination (*k*=1). Twenty studies were conducted as a part of a screening program. Most included both attendees and non-attendees of screening (*k*=73), 11 studies included ever-screened participants; 9 studies included never-screened participants; while 10 studies did not report.

Out of 103 studies, 37 reported barriers, 13 facilitators and 55 both barriers and facilitators. Only 30 studies focused exclusively on barriers or facilitators to screening while 73 studies focused on participants' attitudes, beliefs and knowledge of a disease of which barrier to screening was only a constituent of the studies. Among the 103 studies, 47 compared men's barriers and facilitators to those of women while 56 only focused on men's barriers. Of 24 quantitative studies comparing barriers/facilitators between men and women, only 13 reported *p*-values in their studies.

Barriers and Facilitators to Health Screening in Men

Factors influencing uptake of health screening in men fall within five domains: individual, social, health system, healthcare professional and screening procedure (Table 1). The six individual factors that influence health screening uptake in men are knowledge, attitudes and values, fear, masculinity attributes, communication and resources. Factors within the social domain include influence of family and/or peers as well as stigma. For the health system domain, factors include accessibility to screening services, cost and insurance, health information, screening program or policy, men's health advocacy and quality of service. Healthcare professional factors include attitudes, communication, physician's gender and ethnicity as well as physician's recommendation. The nature of the screening procedure also affects men's decisions as to whether or not to attend health screening.

[INSERT TABLE 1 ABOUT HERE]

There are several barriers and facilitators under each factor. The most commonly reported barrier to health screening across all domains is fear of being diagnosed with the disease and its consequences (k=52) (Table 2), followed by a perception of low risk (k=39) and fear of a painful screening procedure (k=37). The most commonly reported facilitators are perceived risk (k=31), perceived benefits of screening (k=29) and physicians' recommendations to attend screening (k=24).

[INSERT TABLE 2 ABOUT HERE]

Table 3 shows barriers and facilitators to screening found to be dominant in heterosexual men based on the 57 qualitative studies. Heterosexual self-presentation (k=18), avoidance of femininity (k=18), self-reliance (k=10), seeking help only when disease is severe (k=9) and avoidance of illness (k=7) are the most commonly reported male dominant barriers to screening. Partner's role (k=18), perceived risk (k=2), wanting to stay healthy to

take care of family (k=2), non-invasive screening procedure (k=2) and physicians' gender (k=2) are the most commonly reported male dominant facilitators to screening.

[INSERT TABLE 3 ABOUT HERE]

Table 4 shows barriers and facilitators to screening found to be dominant in men based on the 13 quantitative studies. Lack of time (k=6), fear of getting disease and its consequences (k=2), painful screening procedure (k=2) and lack of knowledge about disease and screening (k=2) are the barriers found to be significantly more common in men compared to women. For facilitators, having knowledge about disease and screening (k=1) and physician's recommendation to screening (k=1) were found to be more important in men. However, unlike qualitative studies, masculinity factors were rarely reported in the quantitative studies.

[INSERT TABLE 4 ABOUT HERE]

Among the five domains, the individual domain is the most commonly cited domain in the ten most commonly reported barriers (70.0%) as well as in qualitative (60.9%) and quantitative studies (62.5%) reporting male-dominant barriers (Table 5). The pattern is less obvious for the facilitators to health screening in men.

[INSERT TABLE 5 ABOUT HERE]

Quality Assessment

Overall, included studies carried a moderate risk of bias. Most qualitative studies satisfied all assessment criteria except for criteria 4, where most studies did not report whether the researchers' role might influence the outcome of the study (Appendix B). The quality of quantitative studies was substantially lower as only about half of the studies

satisfied criteria 1 (sampling strategy) and criteria 4 (response rate). These patterns were almost similar to the included mixed-method studies. The quality of mixed-method integration was moderate.

Discussion

This systematic review is the first to provide a comprehensive coverage of barriers and facilitators to health screening in men. The barriers and facilitators extracted in this study are those specifically expressed by men and are different from other disease-specific systematic reviews, which are often not gender-specific. Masculinity and characteristics of the screening procedure are highlighted as two important factors among the list of barriers and facilitators that influence men's decisions in taking up screening. We also identified the most common factors as well as those that are predominant in men.

This review identified 'masculinity' as an important factor which impedes screening in men; this factor is seldom highlighted in the literature as a barrier to screening in men. We used a previously published concept of masculinity as part of our analysis framework during data extraction (Christy et al., 2014) and masculinity attributes such as self-reliance, avoidance of femininity and heterosexual self-presentation emerged as barriers to screening. Only 'invincibility belief' emerged as a new barrier under masculinity attributes from the studies. Interestingly, an important masculinity attribute on 'risk taking' did not feature specifically as a barrier in the studies included in this review, which could be because 'risk taking' is an attribute that is difficult to probe in an interview when men do not perceive themselves to be at risk. We also realized that most papers included in this review only discussed masculinity in the context at individual level. Nonetheless, masculinity can be structured in institutional practices and policies, which are not explored in this review

(Connell, 1987, 1995; Dovel et al., 2015). Some of the individual factors, such as 'avoiding and denying illness', 'seek help only when disease is severe', and 'fear of getting disease', could be related to masculinity, but the authors did not explicitly report the link. Future studies should explore this issue.

'Screening procedure' was another unique factor that emerged from our review. Though many studies identify screening procedures as a barrier, such as the collection of faeces for bowel cancer screening, different procedures impose different levels of reluctance for men to present for screening (Lo et al., 2013; Vart, 2010). Procedures that are most commonly cited as a barrier are digital rectal examination, colonoscopy and sigmoidoscopy. Such procedures, involving anal penetration, have a sexual connotation and heterosexual men are concerned that they might be perceived as being gay. Clinicians should emphasize that these procedures are recommended for all men and the invasive nature of the procedure is necessary to detect tumors in the colon; therefore, men should not perceive the procedures as being gay. Unlike other factors, such as individual, social, healthcare system and healthcare professional factors, which are non-disease specific, screening procedure is therefore disease-specific. More work needs to be done to overcome this barrier.

In the included studies, the most commonly reported factor influencing men's attendance at health screening relates to their knowledge regarding health and screening, which in turn, affects men's perception of their own health risk and the benefits of screening. Some men are fearful of being diagnosed with the disease if they go for screening and, therefore, choose not to know about their health status. It is important for healthcare providers to assess and provide information on individual health risks as well as to explain the benefit and risks of health screening.

We also identified several male-dominant barriers and facilitators to health screening in men. Masculinity attributes such as heterosexual self-presentation, avoidance of femininity and self-reliance are the most commonly cited male-dominant barriers to screening. It is important to note that masculinity attributes vary in different contexts. For example, a study comparing barriers to colorectal screening between two Hispanics subpopulations, Spanish Americans and first-generation Mexicans, in New Mexico, USA found that machismo is more prominent in the latter (Getrich et al., 2012). Other barriers, such as lack of time, lack of knowledge, fear and screening procedure are also found more predominantly in men. For facilitators to screening, knowledge, partner's role and physicians' recommendation are the most important factors that motivate men to attend health screening.

We also found that while individual factors contribute to most barriers to health screening in men, it is not as commonly cited as a facilitator. Thus, for a screening intervention targeting men to be effective, it may not be enough to just address individual barriers; strategies involving external factors, such as family and friends, health system, healthcare professional and screening procedure, may need to be incorporated to enhance screening uptake. A study by Holland et al has found that combining personalized letter to men and a reminder system by the healthcare professional resulted in a higher uptake of health screening as compared to sending a personalized letter alone (Holland et al., 2005). The uptake is even higher when the intervention was supplemented by asking the partners to encourage men to go for health screening.

Another important point to note is that this systematic review only included studies that reported barriers and facilitators to screening from men themselves independent from associations with social determinants to screening uptake. Dryden et al reported that those not attending health checks were typically from low socio-economic status, less well educated, single (not married), smokers, having low self-efficacy and less likely to believe in the

efficacy of health checks. In contrast attenders were usually White and older in age (Dryden et al., 2012). We did not include these social determinants because this systematic review aimed to find out the actual barriers and facilitators to screening in men irrespective of the profile of men who would or would not seek help.

Limitations

This review has several limitations. This review did not include studies focusing on men who were gene carriers, prisoners, disabled, drug users, in military service, homeless, immigrants, refugees as well as aboriginal and gay men. These groups of men face additional barriers when seeking healthcare and deserve separate reviews, some of which have been published. For example, systematic reviews have been conducted on barriers to HIV testing in men who have sex with men (MSM) (Lorenc et al., 2011) and hepatitis C testing in people who inject drugs (Jones et al., 2014).

We also did not analyze the barriers and facilitators according to age, which may influence how men decide to go for screening. Most of these studies included in this systematic review were conducted in Western countries, which may reduce their validity in the global South. We also identified four potentially relevant non-English articles (2 Japanese; 1 Korean; 1 Swedish) which we did not include in this review.

The quality of the quantitative studies included in this review was generally poor, particularly in terms of questionnaire design. The questionnaires were not validated rigorously and factor analysis was typically not performed. Some included options represent compound questions (e.g., 'costly/lack of insurance'); some responses were not meaningful (e.g., 'I do not know' and 'I just do not want to'). Unlike the findings from qualitative studies, the barriers and facilitators reported in quantitative studies lack depth and hence were less

useful for the understanding of the factors that influence men's decision to attend screening. We only reported 'commonly reported barriers' rather than 'the most common barriers' due to the heterogeneity of study methods. Some studies permitted participants to choose multiple barriers while others only allowed them to choose the single most important barrier. Masculinity-related factors are less commonly reported because it is both difficult to ask men about this and, in turn, for them to admit such issues. Many studies did not incorporate masculinity attributes in the design of the questionnaire. Additionally, only 13 out of 24 studies that compared men and women reported a *p*-value. Further evidence is required to support the male-dominant barriers or facilitators based on *p*-values, such as reported in this review. We also did not exclude lower quality studies based on the MMAT in order to elicit the widest possible range of barriers and facilitators.

Conclusion

This systematic review identified individual, social, health system, healthcare professional and screening procedure factors as important barriers and facilitators to health screening in men. In addition, it expands existing framework on factors influencing health screening uptake in men, incorporating male-dominant barriers and facilitators such as avoidance of femininity, heterosexual self-presentation and partner's role into the framework. The findings from this review also provide a better understanding of men's screening behaviour; they highlight the importance of considering the role of gender when advising men on health screening and when developing health policy on health prevention. The development of interventions to promote health screening should take into consideration the gender-specific barriers and facilitators identified in this review.

Conflict of Interest:

The authors declare that there is no conflict of interest.

Appendices:

Appendix A. Search strategy

Appendix B. Quality appraisal result (MMAT)

Appendix C. Male dominant criteria

Appendix D. Characteristics of included studies

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Table 1. Barriers and facilitators to health screening in men synthesized from all studies.

INDIVIDUAL DOMAIN		
FACTORS	**Barriers**	**Facilitators**
Knowledge	• Low risk perception (lack of symptom, no family history) • Lack of knowledge about disease and screening • Feeling inferior/fear of attending screening due to limited education and literacy	• Perceived at risk (having symptoms, having family history, being old and following a risky event) • Having knowledge about disease and screening
Attitudes and values	○ Avoiding and denying illness ○ Fatalism belief ○ Negative attitude (lazy, procrastination or forgot) ○ Sceptical of the benefits of screening ○ Seek help only when disease is severe ○ Health is not a priority ○ Not trusting the doctor or health system ○ Having other health concerns ○ Already tested or diagnosed ○ Belief that illness can be healed naturally or with CAM	○ Religious belief that a man should take care of his body ○ Positive attitude (health conscious, screening as a routine and care for others) ○ Perceived benefits of screening (early intervention and peace of mind) ○ Stay healthy to take care of family ○ Trusting the doctor or health system ○ Already tested or diagnosed
Emotion - Fear	▪ Fear of getting disease and consequence and don't want to know	▪ Fear of disease and consequence and want to find out earlier
Masculinity	➢ Avoidance of femininity - seeking help or talking about health is considered feminine or weak ➢ Heterosexual self-presentation - Undergoing DRE	➢ Heterosexual self-presentation - Use other

	or colonoscopy may be perceived as gay	screening method rather than DRE
	➢ Self-reliance - do not want to depend on doctors	➢ To feel in control
	➢ Invincibility belief	➢ Non-existence of machismo attributes
Communication	× Discomfort discussing issues regarding private part and disease	
	× Language barrier	
Resource	✓ Lack of time	
	✓ Lack of income and personal insurance	✓ Having personal insurance
	✓ Lack of personal transport	✓ Having personal transportation
SOCIAL DOMAIN		
FACTORS	**Barriers**	**Facilitators**
Family and peer influence	• Lack of encouragement	• Encouragement and support from siblings, children, relative, friends and other social contact
	• Past negative health care experience	• Partner's role
	• No social contact with the disease	• Knowing someone with disease or died due to the disease
Stigma	○ Concern about being stigmatized	
HEALTH SYSTEM DOMAIN		
FACTORS	**Barriers**	**Facilitators**
Accessibility to screening services	• Inconvenient opening hour, day and location	• Convenient screening location, hour and day
	• Difficulty in making appointment	• Screening without appointment required
	• Long waiting time	• Short waiting time
	• Busy HCP	
Cost and insurance	○ Costly services	○ Free/reduced cost exams
	○ Lack of insurance	○ Having insurance coverage
Health information	▪ Lack of public education	▪ More public education programs through media, community, school and health centre

	▪ Inaccurate and negative information	▪ Church as a platform to promote health screening ▪ Celebrity-led campaign and advertisement
Screening programme or policy		➢ Availability of screening program or policy (workplace, marriage)
Men's health advocacy	× Lack of men's health advocacy	
Quality of service	✓ Male-unfriendly healthcare setting ✓ Lack of confidentiality ✓ Negative experience in health centre ✓ Limited access to treatment	✓ Reminder by health provider ✓ Confidentiality ✓ Opportunistic screening ✓ Availability of treatment ✓ Trained HCP
HEALTHCARE PROFESSIONAL DOMAIN		
FACTORS	**Barriers**	**Facilitators**
Attitude	• Negative attitude (rude, discrimination and uncaring)	
Communication	• Lack of rapport with doctor • Lack of bilingual physicians	• Having good rapport with doctor • Availability of bilingual healthcare professional • Shared decision making
Physician's gender and ethnicity	○ Availability of physician of the same ethnicity	○ Preference of female physicians to perform DRE
Physician's recommendation	▪ Lack of physician recommendation for screening tests	▪ Recommended to screening
SCREENING PROCEDURE DOMAIN		
FACTORS	**Barriers**	**Facilitators**
The nature of screening	• Painful and uncomfortable • Embarrassing procedure	• Less painful and discomfort procedure

procedure	• Complication following procedure • Lack of privacy • Difficult procedure preparation • Difficult sample collection • Impersonal procedure • Screening package lack comprehensiveness	• Convenience test procedure

CAM=Complementary alternative medicine. DRE=Digital Rectal Examination. HCP=Healthcare Professional.

Table 2. Ten most commonly reported barriers and facilitators to health screening in men from all studies.

Barriers	No. of citing studies (k=92)	Facilitators	No. of citing studies (k=68)
Fear of getting disease and consequence (I)	52	Perceived at risk - having symptoms, having family history, being old and following a risky event (I)	31
Low risk perception - lack of symptom, no family history (I)	39	Perceived benefits of screening - early intervention and peace of mind (I)	29
Painful and uncomfortable screening procedure (SP)	37	Physician's recommendation to screening (HCP)	24
Lack of time (I)	33	Partner's role (S)	22
Lack of knowledge about disease and screening (I)	30	More public education program through media, community, school and health centre (HS)	18
Embarrassing screening procedure (SP)	29	Positive attitude - health conscious, screening as a routine and care for others (I)	16
Costly screening services (HS)	23	Knowing someone with disease or died due to the disease (S)	15
Seeking help or talking about health is considered feminine or weak (I)	21	Encouragement and support from siblings, children, relative, friends and other social contact (S)	12
Undergoing DRE or colonoscopy may be perceived as gay (I)	20	Availability of screening program or policy - workplace, marriage (HS)	11
Avoiding and denying illness (I)	20	Having knowledge about disease and screening (I)	11

DRE=Digital Rectal Examination. HCP=Healthcare Professional. HS=Health System. I=Individual. S=Social. SP=Screening Procedure.

Table 3. Barriers and facilitators to screening found to be dominant in men based on 57 qualitative studies.

FACTORS	Number of studies
Barriers	
Heterosexual self-presentation - Undergoing DRE[6] or colonoscopy may be perceived as gay (I)	18
Avoidance of femininity - seeking help or talking about health is considered feminine or weak (I)	18
Self-reliance - do not want to depend on doctors (I)	10
Seek help only when disease is severe (I)	9
Avoiding and denying illness (I)	7
Invincibility belief (I)	6
Embarrassing screening procedure (SP)	5
Health is not a priority (I)	4
Fear of getting disease and consequence (I)	4
Lack of encouragement (S)	3
Male-unfriendly healthcare setting (HS)	3
Lack of privacy (SP)	3
Lack of knowledge about disease and screening (I)	3
Fatalism belief (I)	3
Lack of Men's Health Advocacy (HS)	2
Negative attitude - lazy, procrastination or forgot (I)	2
Lack of public education (HS)	2
Not trusting the doctor or health system (I)	2
Low risk perception - lack of symptom, no family history (I)	2
Difficult sample collection (SP)	1
Complication following procedure (SP)	1

Lack of time (I)	1
Concern about being stigmatized (S)	1
Facilitators	
Partner's role (S)	18
Heterosexual self-presentation - Use other screening method rather than DRE[6] (SP)	2
Preference of female physicians to perform DRE[6] (HCP)	2
Stay healthy to take care of family (I)	2
Perceived at risk - Having symptoms, having family history, being old and following a risky event (I)	2
Inexistence of machismo attributes (I)	1
To feel in control (I)	1
Opportunistic screening (HS)	1
Convenience test procedure (SP)	1
More public education programs through media, community, school and health center (HS)	1
Recommended to attend screening (HCP)	1

DRE=Digital Rectal Examination. HCP=Healthcare Professional. HS=Health System. I=Individual. S=Social. SP=Screening Procedure.

Table 4. Barriers and facilitators to screening which are either more dominant in men (Sig-male), no significant difference (*ns*), or more dominant in women (Sig-female) based on *p*-value reported in 13 quantitative papers.

FACTORS	Sig-male	*ns*	Sig-female
Barriers			
Lack of time (I)	6	1	0
Fear of getting disease and consequence (I)	2	5	2
Painful and uncomfortable (SP)	2	2	1
Lack of knowledge about disease and screening (I)	2	1	0
Low risk perception - lack of symptom, no family history (I)	1	4	1
Embarrassing procedure (SP)	1	1	3
Complication following procedure (SP)	1	1	1
Skeptical of the benefits of screening (I)	1	1	0
Costly services (HS)	0	5	0
Difficult procedure preparation (SP)	0	2	1
Negative attitude - lazy, procrastination or forgot (I)	0	2	0
Lack of personal transport (I)	0	2	0
Concern about being stigmatized (S)	0	2	0
Inconvenient opening hour, day and location (HS)	0	2	0
Having other health concerns (I)	0	1	1
Already tested or diagnosed (I)	0	1	1
Lack of physician's recommendation (HCP)	0	1	1
Avoiding and denying illness (I)	0	1	0
Health is not a priority (I)	0	1	0
Lack of income and personal insurance (I)	0	1	0

Past negative health care experience (HS)	0	1	0
Difficulty in making appointment (HS)	0	1	0
Lack of confidentiality (HS)	0	1	0
HCP's negative attitude (HCP)	0	1	0
Difficult sample collection (SP)	0	1	0
Lack of encouragement (S)	0	0	1
Facilitators			
Having knowledge about disease and screening (I)	1	0	0
Recommended to screening (HCP)	1	0	0
Perceived at risk - Having symptoms, having family history, being old and following a risky event (I)	0	2	1
Availability of screening program or policy - workplace, marriage (HS)	0	2	0
Perceived benefits of screening - early intervention and peace of mind (I)	0	1	0
Partner's role (S)	0	1	0
Positive attitude - Health conscious, screening as a routine and care for others (I)	0	0	1
Physician of the same gender (HCP)	0	0	1

HCP=Healthcare Professional. HS=Health System. I=Individual. S=Social. SP=Screening Procedure.

Table 5. Summary of the ten most commonly reported and male-dominant (qualitative and quantitative study) barriers and facilitators to screening in men according to domain.

DOMAIN	Barriers *k* (%)	Facilitators *k* (%)
Ten most commonly reported factors	**10 (100%)**	**10 (100%)**
Individual (I)	7 (70.0%)	4 (40.0%)
Social (S)	0 (0%)	3 (30.0%)
Health system (HS)	1 (10.0%)	2 (20.0%)
Healthcare professional (HCP)	0 (0%)	1 (10.0%)
Screening procedure (SP)	2 (20.0%)	0 (0%)
Male-dominant - qualitative study	**23 (100%)**	**11 (100%)**
Individual (I)	14 (60.9%)	4 (36.4%)
Social (S)	2 (8.7%)	1 (9.1%)
Health system (HS)	3 (13.0%)	2 (18.2%)
Healthcare professional (HCP)	0 (0%)	2 (18.2%)
Screening procedure (SP)	4 (17.4%)	2 (18.2%)
Male-dominant - quantitative study	**8 (100%)**	**2 (100%)**
Individual (I)	5 (62.5%)	1 (50.0%)
Social (S)	0 (0%)	0 (0%)
Health system (HS)	0 (0%)	0 (0%)
Healthcare professional (HCP)	0 (0%)	1 (50.0%)
Screening procedure (SP)	3 (37.5%)	0 (0%)

Appendix A. Search strategy

PubMed (*k*=5906)

NO.	SEARCH STRATEGY
#5	**(#1 AND #2 AND #3 AND #4)**
#4	(Qualitative Research[mh] OR Interviews as topic[Mh] OR Questionnaires[Mh] OR Nursing methodology research[mh] OR Qualitative[tiab] OR "Focus group*"[tiab] OR Interview*[tiab] OR Survey*[tiab])
#3	(facilitat*[tiab] OR encourag*[tiab] OR promot*[tiab] OR motivat*[tiab] OR enabl*[tiab] OR Predict*[tiab] OR Support*[tiab] OR barrier*[tiab] OR obstacle*[tiab] OR difficult*[tiab] OR imped*[tiab] OR reluctan*[tiab] OR refus*[tiab] OR Counteract*[tiab] OR Challeng*[tiab] OR Utiliz*[tiab] OR Utilis*[tiab] OR Uptake*[tiab] OR Decision making[mh] OR patient acceptance of health care[mh] OR attitude to health[mh])
#2	(Early diagnosis[mh] OR mass screening[mh] OR preventive health services[mh:noexp] OR Screen*[tiab] OR "Health check*"[tiab] OR checkup*[tiab] OR check-up*[tiab] OR ((routine[tiab] OR regular[tiab] OR yearly[tiab] OR annual[tiab] OR periodic[tiab]) AND ("health examination" [tiab] OR "medical examination" [tiab] OR "health assessment" [tiab])))
#1	(Male[tiab] OR Man[tiab] OR Males[tiab] OR Men[tiab] OR Boy[tiab] OR Boys[tiab] OR Gender*[tiab] OR Prostat*[tiab])

EMBASE (*k* =8399)

NO.	SEARCH STRATEGY
#5	**#1 AND #2 AND #3 AND #4**
#4	'qualitative research'/exp OR qualitative:ab,ti OR 'interview'/exp OR 'questionnaire'/exp OR 'nursing methodology research'/exp OR 'focus group':ab,ti OR 'focus groups':ab,ti OR interview*:ab,ti OR survey*:ab,ti
#3	facilitat*:ab,ti OR encourag*:ab,ti OR promot*:ab,ti OR motivat*:ab,ti OR enabl*:ab,ti OR predict*:ab,ti OR support*:ab,ti OR barrier*:ab,ti OR obstacle*:ab,ti OR difficult*:ab,ti OR imped*:ab,ti OR reluctan*:ab,ti OR refus*:ab,ti OR counteract*:ab,ti OR challeng*:ab,ti OR utiliz*:ab,ti OR utilis*:ab,ti OR uptake*:ab,ti OR 'decision making'/exp OR 'patient attitude'/exp OR 'attitude to health'/exp
#2	male:ab,ti OR man:ab,ti OR males:ab,ti OR men:ab,ti OR boy:ab,ti OR boys:ab,ti OR gender*:ab,ti OR prostat*:ab,ti
#1	'early diagnosis'/exp OR 'mass screening'/de OR 'anonymous testing'/de OR 'auditory screening'/de OR 'cancer screening'/de OR 'genetic screening'/de OR 'preventive health services'/de OR screen*:ab,ti OR 'health check':ab,ti OR 'health checks':ab,ti OR checkup*:ab,ti OR 'check up':ab,ti OR 'check ups':ab,ti OR (routine:ab,ti OR regular:ab,ti OR yearly:ab,ti OR annual:ab,ti OR periodic:ab,ti AND ('health examination':ab,ti OR 'medical examination':ab,ti OR 'health assessment':ab,ti))

CINAHL via EBSCOHOST (*k* =2513)

NO.	SEARCH STRATEGY
#5	**(#1 AND #2 AND #3 AND #4)**
#4	(MH “Qualitative Research”+) OR (MH "Interviews+") OR (MH "Focus Groups") OR (MH "Questionnaires+") OR TI (Qualitative OR “Focus group*” OR Interview* OR Survey*) OR AB (Qualitative OR “Focus group*” OR Interview* OR Survey*)
#3	TI (facilitat* OR encourag* OR promot* OR motivat* OR enabl* OR Predict* OR Support* OR barrier* OR obstacle* OR difficult* OR imped* OR reluctan* OR refus* OR Counteract* OR Utiliz* OR Utilis* OR Uptake*) OR AB (facilitat* OR encourag* OR promot* OR motivat* OR enabl* OR Predict* OR Support* OR barrier* OR obstacle* OR difficult* OR imped* OR reluctan* OR refus* OR Counteract* OR challeng* OR Utiliz* OR Utilis* OR Uptake*) OR (MH "Decision Making, Patient") OR (MH "Decision Making") OR (MH "Decision Support Techniques") OR (MH "Attitude to Health") OR (MH "Health Beliefs") OR (MH "Attitude to Risk") OR (MH "Attitude to Life") OR (MH "Patient Attitudes")
#2	TI (Male OR Man OR Males OR Men OR Boy OR Boys OR Gender* OR Prostat*) OR AB (Male OR Man OR Males OR Men OR Boy OR Boys OR Gender* OR Prostat*) OR (MH "Gender Bias")
#1	(MH "Health Screening+") OR (MH "Early Diagnosis+") OR (MH "Preventive Health Care") OR TI (Screen* OR “Health check*” OR Checkup* OR check-up* OR ((routine OR regular OR yearly OR annual OR periodic) AND (‘health examination’ OR ‘medical examination’ OR ‘health assessment’))) OR AB (Screen* OR “Health check*” OR Checkup* OR check-up* OR ((routine OR regular OR yearly OR annual OR periodic) AND (‘health examination’ OR ‘medical examination’ OR ‘health assessment’)))

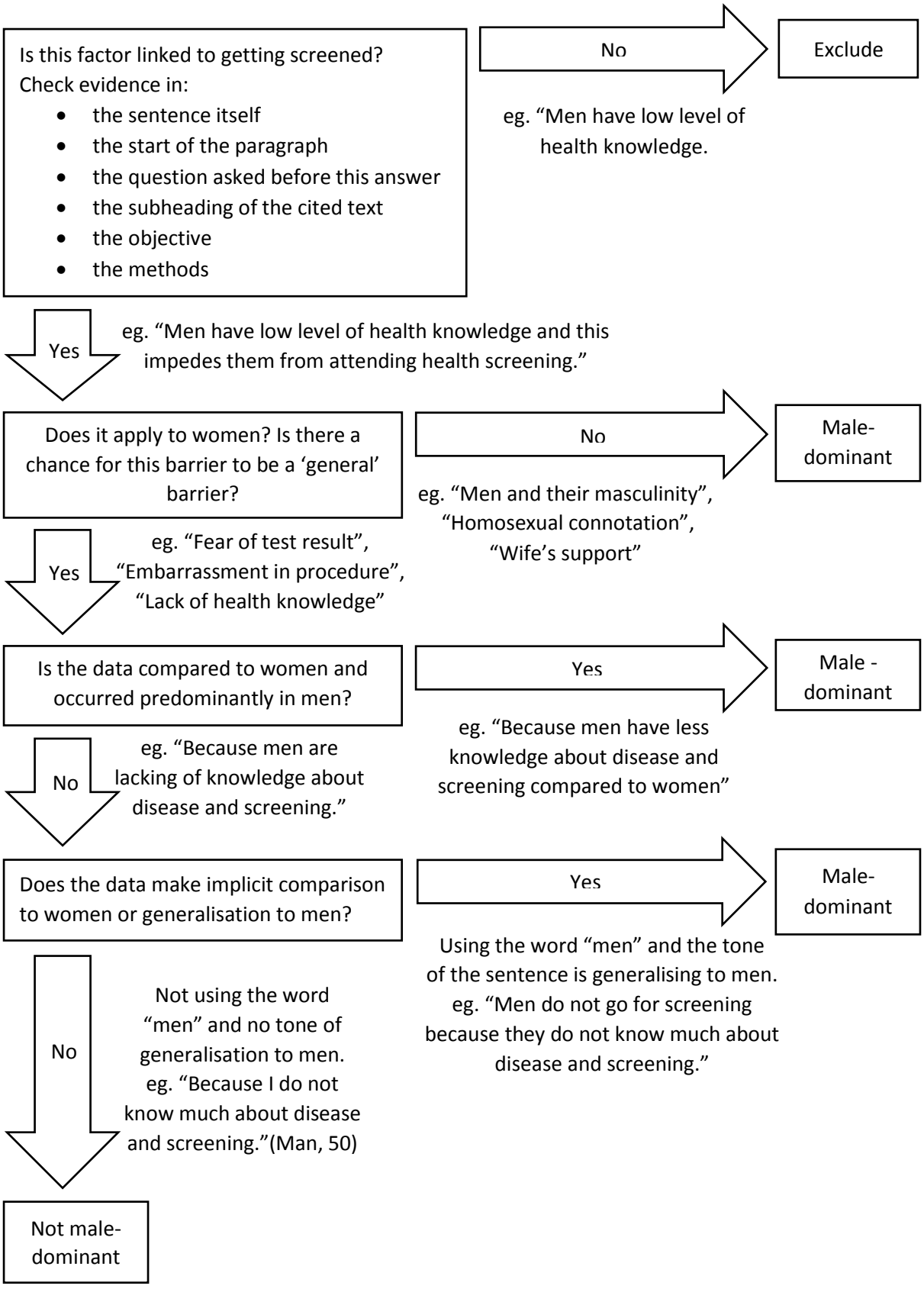
PscyInfo via OvidSP (*k* =1942)

NO.	SEARCH STRATEGY
#5	(#1 and #2 and #3 and #4)
#4	exp Qualitative Research/ or exp Questionnaires/ or Interviews/ or Qualitative.ti,ab. or 'Focus group*'.ti,ab. or Interview*.ti,ab. or Survey*.ti,ab.
#3	(facilitat* or encourag* or promot* or motivat* or enabl* or Predict* or Support* or barrier* or obstacle* or difficult* or imped* or reluctan* or refus* or Counteract* or challeng* or Utiliz* or Utilis* or Uptake*).ti,ab. or exp Decision making/ or exp health attitude/ or health behaviour/
#2	(Male or Man or Males or Men or Boy or Boys or Gender* or Prostat*).ti,ab. or Human sex differences/
#1	exp health screening/ or preventive medicine/ or Screen*.ti,ab. or 'Health check'.ti,ab. or 'Health checks'.ti,ab. or Checkup*.ti,ab. or check-up*.ti,ab. or ((routine or regular or yearly or annual or periodic) and ('health examination' or 'health examinations' or 'medical examination' or 'medical examinations' or 'health assessment' or 'health assessments')).ti,ab.

Web of Science (*k* =6730)

NO	SEARCH STRATEGY
# 5	**#4 AND #3 AND #2 AND #1**
# 4	TOPIC: (Qualitative OR “focus group*” OR “interview*” OR Questionnaire* OR Survey*)
# 3	TOPIC: (facilitat* OR encourag* OR promot* OR motivat* OR enabl* OR Predict* OR Support* OR barrier* OR obstacle* OR difficult* OR imped* OR reluctan* OR refus* OR Counteract* OR Challeng* OR Utiliz* OR Utilis* OR Uptake* OR “Decision making” OR Attitude* OR Accept*)
# 2	TOPIC: (Male OR Man OR Males OR Men OR Boy OR Boys OR Gender* OR Prostat*)
# 1	TOPIC: (“Early diagnosis” OR “Early detection” OR Screen* OR “Health check*” OR checkup* OR check-up* OR “preventive health” OR ((routine OR regular OR yearly OR annual OR periodic) AND ("health examination” OR “medical examination” OR “health assessment”)))

Appendix B. Criteria for male-dominant barriers and facilitators in qualitative studies



Appendix C. Results of quality assessment using MMAT.

Criteria		QL *k*=53	QN *k*=44	MM *k*=6
QL.1. Are the sources of qualitative data (archives, documents, informants, observations) relevant to address the research question (objective)?	Yes	89%		67%
	No	2%		0%
	Can't tell	9%		33%
QL.2. Is the process for analyzing qualitative data relevant to address the research question (objective)?	Yes	92%		50%
	No	2%		33%
	Can't tell	6%		17%
QL.3. Is appropriate consideration given to how findings relate to the context, e.g., the setting, in which the data were collected?	Yes	100%		100%
	No	0%		0%
	Can't tell	0%		0%
QL.4. Is appropriate consideration given to how findings relate to researchers' influence, e.g., through their interactions with participants?	Yes	8%		0%
	No	83%		100%
	Can't tell	9%		0%
QN.1. Is the sampling strategy relevant to address the quantitative research question (quantitative aspect of the mixed methods question)?	Yes		61%	83%
	No		9%	17%
	Can't tell		30%	0%
QN.2. Is the sample representative of the population understudy?	Yes		91%	83%
	No		0%	0%
	Can't tell		9%	17%
QN.3. Are measurements appropriate (clear origin, or validity known, or standard instrument)?	Yes		98%	100%
	No		0%	0%
	Can't tell		2%	0%
QN.4. Is there an acceptable response rate (60% or above)?	Yes		41%	50%
	No		23%	33%
	Can't tell		36%	17%
M.1. Is the mixed methods research design relevant to address the qualitative and quantitative research questions (or objectives), or the qualitative and quantitative aspects of the mixed methods question/objective?	Yes			83%
	No			17%
	Can't tell			0%
M.2. Is the integration of qualitative and quantitative data (or results*) relevant to address the research question (objective)?	Yes			50%
	No			17%
	Can't tell			33%
M.3. Is appropriate consideration given to the limitations associated with this integration, e.g., the divergence of qualitative and quantitative data (or results*) in a triangulation design?	Yes			33%
	No			17%
	Can't tell			50%

*Type of study: QL=Qualitative; QN=Quantitative; MM=Mixed-method

Appendix D. Summary of the characteristics of studies included in this review.

CHARATERISTICS	No. of studies (k=103)
Type of study	
• Qualitative	53
• Quantitative	44
• Mixed-method	6
Gender focus	
• Focusing on men's barriers only	56
• Comparing men's and women's barriers	47
Barrier/facilitator or broad focus	
• Main focus on barrier	30
• Broad focus (knowledge, attitude, belief)	73
Outcome reported (barrier or facilitator)	
• Barrier only	37
• Facilitator only	13
• Both	55
Study design	
• Cross-sectional	44
• Grounded theory	3
• Phenomenology	2
• Ethnography	1
• Not reported (qualitative)	53
Range of study dates	1985-2012
Country	
• North America (USA & Canada)	62
• Europe (UK, Germany, Spain, Sweden, Denmark, France & Israel)	14
• Africa (Uganda, Nigeria, South Africa, Burkina Faso and Ethiopia)	9
• Oceania (Australia & New Zealand)	8
• Asia (Japan, China, Hong Kong, Singapore & Taiwan)	6
• South & Central America (Brazil, Jamaica, Trinidad and Tobago)	4
Setting	
• Healthcare setting	19
• Community	70
• Both	3
• Not reported	11
Disease	

• Prostate cancer	40
• Colorectal cancer	33
• HIV	15
• Sexually transmitted diseases	4
• Cancer (in general)	4
• Testicular Cancer	3
• Cardiovascular disease	2
• Skin cancer	1
• Multiphasic examination	1
Screening programme involved	
• Yes	20
• No	83
Age range	14-98 years
Screening status	
• Ever	11
• Never	9
• Both	73
• Not reported	10
Sampling strategy	
• Convenience	36
• Purposive	31
• Random	17
• Universal	6
• Not reported	6
• Systematic	5
• Consecutive	2
Data collection method	
• Self-completion questionnaire	15
• Interviewer-assisted	18
• Telephone interview	6
• Postal questionnaire	7
• Focus group discussion	31
• In-depth interview	24
• Focus group discussion and In-depth interview	4
Theories used	
• Not Reported	65
• Health belief model	16
• No theory used (grounded theory)	5

• Theory of planned behaviour	1
• Theory of reasoned action	1
• Transtheoretical model	1
• Social marketing	1
• Andersen's Behavior Model of Health Services Use	1
• Preventive Health Model	1
• Social-cognitive models, health action process approach	1
• Health Belief Model and Social Determinants of Health	1
• Culture Care Diversity and Universality theory	1
• Precaution Adoption Process Model	1
• Masculinity and health theory (Courtenay)	1
• Predisposing, Reinforcing, and Enabling Constructs in Educational/Environmental Diagnosis and Evaluation (PRECEDE) model	1
• Cues to action	1

Characteristics of included qualitative studies (*k*=53)

First author and year	Disease for screening	Country and setting	Year of study	Gender focus	Sampling and sample size	Ethnicity, age and screening status	Theory used	Data collection method	Data analysis
Austin 2009	Colorectal Cancer	UK NR	Feb 2007 – July 2008	Comparison	Convenience 20 men 33 women	Minorities 50 - 78 NR	Health belief model	FGD	Framework and thematic
Bass 2011	Colorectal Cancer	USA Healthcare setting	Sep 2007 – Feb 2008	Comparison	Purposive 8 men 25 women	African American 50 - 64 Both	NR	FGD	Thematic
Blocker 2006	Prostate Cancer	USA Community	Fall 2002 – winter 2003	Male-specific	Convenience 14 men 15 women	African American 34 - 68 Both	Health Belief Model	FGD	Thematic
Carter 2008	Prostate Cancer	USA Community	NR	Male-specific	NR 35 men 39 women	African American >40 Both	NR	FGD	Thematic
Chaudhary 2010	Chlamydia	UK Community	NR	Male-specific	Purposive 15 men	Various 19-24 Both	NR	FGD	Thematic
Christianson 2008	HIV	Sweden Healthcare setting	NR	Comparison	Convenience 9 men 14 women	Various 18-24 Ever-screened	NR	FGD	Thematic
Conde 2011	Prostate Cancer	USA Community	NR	Male-specific	Purposive 20 men	Filipino above 40 Both	NR	FGD	Thematic
Dale 1999	Prostate Cancer	USA Community	NR	Male-specific	Convenience 96 men	African American and White 39 to 95 Both	Health belief model	FGD	Framework and textual
Elwood 1975	Multiphasic examinatio n	USA NR	NR	Male-specific	Systematic 25 men	White 53-62 Never-screened	NR	IDI	NR

Evans 2007	Prostate Cancer	UK Community	NR	Male-specific	Purposive 28 men	White 40 to 75 Both	NR	IDI	Constant comparison and thematic
Fernandez 2008	Colorectal Cancer	USA Community	NR	Comparison	Purposive 33 men 55 women 5 female lay health worker	Latino 50 to 91 Both	NR	FGD	Thematic
Ferrante 2011	Prostate Cancer	USA Community	Mar 2009 – May 2010	Male-specific	Purposive 64 men	Various 50 and above Both	Andersen's Behavior Model of Health Services Use	IDI	Grounded
Ford 2006	Prostate Cancer	USA Community	NR	Male-specific	Random 21 men	African American 55 and above Both	Preventive Health Model	FGD	Content and thematic
Forrester-Anderson 2005	Prostate Cancer	USA Community	NR	Male-specific	Convenience 104 men	African American 40 to 80 Both	Grounded theory	FGD	Thematic
Friedemann-Sanchez 2007	Colorectal Cancer	USA Healthcare setting	Sep 2004 – Dec 2004	Comparison	Purposive 43 men 27 women	Various 50 to 75 Both	Grounded and interpretive	FGD	Grounded and interpretive
Garcia-dominic 2012	Colorectal Cancer	USA NR	Apr 2009 – May 2009	Comparison	Convenience 40 men 42 women	Latino 26-77 Both	Health belief model	FGD	Thematic
Gesink 2014	Colorectal Cancer	Canada NR	Jun 2011 – May 2012	Comparison	Convenience 33 men 88 women 19 HCP	Various 20 and above for HCP, 30 and above for laymen Both	Grounded theory	IDI and FGD	Grounded
Getrich 2012	Colorectal Cancer	USA Healthcare	Aug 2008 – Jul 2009	Comparison	Purposive 26 men	Hispanic 50 and above	NR	IDI	Thematic and Iterative

		setting			26 women 14 HCP	Both			analytic process
Hannover 2010	Prostate Cancer	Germany Healthcare setting	NR	Male-specific	Convenience 83 men	Various 45 above Both	Social-cognitive models, health action process approach	IDI	Content
Harris 1998	Colorectal Cancer	Australia NR	NR	Comparison	Random 12 men 12 women	Various 40 to 70 Ever-screened	NR	FGD	Thematic
Harvey 2011	Prostate Cancer	USA Community	NR	Male-specific	Convenience 15 men	African American 40 and above Both	Preventive health model	FGD	Thematic
Hunter 2007	Cardiovascular	USA NR	May 2002 – Apr 2003	Male-specific	Convenience 29 men 83 women 25 HCP	Mexican American 40 and above NR	NR	IDI	Content and thematic
Ilic 2005	Prostate Cancer	Australia NR	NR	Male-specific	Purposive 67 men	Various 45 above Both	Grounded theory	FGD	Thematic
James 2013	Colorectal Cancer	USA Community	2006 – 2008	Male-specific	Convenience 29 men	American Indian 50 or older Both	NR	FGD	Thematic
Jernigan 2001	Cancer	USA NR	Mar 1998 – May 1998	Comparison	Convenience 26 men 19 women	African American 50 or older Both	NR	FGD	NR
Jones RA 2009	Prostate Cancer	USA Community	NR	Male-specific	Convenience 17 men	African American 40 to 71 Both	NR	IDI	Thematic
Jones RA 2010	Prostate Cancer	USA Community	NR	Male-specific	Convenience 17 men	African American 40 to 71 Both	NR	IDI	Thematic

Larsson 2010	HIV	Uganda Community	Apr 2008 – Apr 2009	Male-specific	Convenience 103 men	Various NR Both	NR	IDI and FGD	Thematic
Lasser 2008	Colorectal Cancer	USA Community	Jan 2005 – Dec 2006	Comparison	Convenience 9 men 14 women 10 HCP	Various 52-74 Both	NR	IDI	Coding and constant comparison
Lupton 1995	HIV	Australia Community	Mar 1993 – Aug 1993	Comparison	Purposive 50 men and women	Various below and above 30 Ever-screened	NR	IDI	Thematic
MacCaffery 2001	Colorectal Cancer	UK Community	NR	Comparison	Purposive 30 men 30 women	Various 55-64 Never-screened	Not using	IDI	Thematic
Madjar 2007	Prostate Cancer	Australia Community	Oct 2004 – Mar 2005	Male-specific	Purposive 38 healthy men 7 healthy women 18 Pca men 9 spouse	Various 18 to 80 Both	NR	IDI and FGD	Thematic
Molina-Barcelo 2011	Colorectal Cancer	Spain Community	Mar – Apr 2009	Comparison	Purposive 24 men 32 women	Various 50 to 69 Both	Health Belief Model and Social Determinants of Health.	FGD	Thematic
Ocho 2013	Prostate Cancer	Trinidad and Tobago Community	Aug 2011 – Jan 2012	Male-specific	Purposive 75 men	Various 19 to 60 Both	NR	FGD	Thematic
Odedina 2004	Prostate Cancer	USA Community	Oct 2001 – Mar 2002	Male-specific	Purposive 49 men	African American 40 and above Both	Not using - Mentioned many but did not apply in	FGD	Ethnographical

							method		
Oliver 2007	Prostate Cancer	USA Community	NR	Male-specific	Convenience 9 men	African American 43 to 72 Both	NR	IDI	Content and thematic
Palmer 2008	Colorectal Cancer	USA Community	Aug 2005 – Mar 2006	Comparison	Convenience 18 men 18 women	African American 50 - 76 Both	Predisposing, Reinforcing, and Enabling Constructs in Educational/ Environmental Diagnosis and Evaluation (PRECEDE) model	IDI	Thematic
Patinkin 2007	HIV	Israel Community	Aug 2003 – Oct 2003	Male-specific	Purposive 10 men	Various 24 to 60 Ever-screened	NR	IDI	Content and thematic
Pinnock 1998	Prostate Cancer	Australia Community	NR	Male-specific	Purposive 134 men 14 women	Various NR NR	Health Belief Model	FGD	analysed according to HBM
Plowden 2006	Prostate Cancer	USA Community	NR	Male-specific	Purposive 12 men 24 sig other/wives/ HCP/child of men at risk	African American Men 40 to 79 others 30 to 72 Both	Culture Care Diversity and Universality theory	IDI	Constant comparative and thematic
Puaina 2008	Cancer	USA Community	NR	Male-specific	Purposive 60 men	Samoan 50 and above NR	NR	FGD	Content and thematic
Rai 2007	Prostate Cancer	UK Community	2005	Male-specific	Purposive 20 men	White 45 to 75 Ever-screened	NR	IDI	Thematic

Reeder 2011	Colorectal Cancer	New Zealand Community	NR	Comparison	Convenience 20 men 30 women	White 50 to 71 NR	NR	IDI	Content
Ritvo 2013	Colorectal Cancer	Canada Community	NR	Comparison	Random 32 men 49 women	Various 50 to 84 Never-screened	Precaution Adoption Process Model	IDI	Constant comparison, grounded and thematic
Robinson 1996	Prostate Cancer	USA NR	Dec 1993 – Feb 1994	Male-specific	Purposive 56 men	African American 40 and above Both	NR	FGD	NR
Salas-Lopez 2007	Cancer	USA Community	NR	Comparison	Convenience 9 medical residents	Various mean = 29.6 NR	NR	FGD	Constant comparison
Sanchez 2007	Prostate Cancer	USA Community	Dec 2004 – Apr 2005	Male-specific	Convenience 31 men	African American 40 to 70 Both	NR	FGD	Thematic
Singleton 2008	Testicular Cancer	Australia Community	NR	Male-specific	Purposive 12 men	Various 18 to 23 Both	Social constructionist of masculinity	FGD	Thematic
Thompson 2012	Colorectal Cancer	New Zealand Community	NR	Comparison	Convenience 27 men 53 women	Various 40 to 70 Both	Men and masculinity	IDI	Thematic
Wackerbarth 2005	Colorectal Cancer	USA Community	NR	Comparison	Purposive 13 men 17 women	Various 48 to 55 Both	Health belief model	IDI	Thematic
Wackerbarth 2008	Colorectal Cancer	USA Community	NR	Comparison	Purposive 13 men 17 women	Various 48-60 Both	Kurt Lewin's theory of decision making	IDI	Constant comparative
Webb 2006	Prostate Cancer	USA Healthcare setting and	NR	Male-specific	Convenience 18 men 14 women	African American 40-70 Both	NR	FGD	Thematic

		community							
Winterich 2009	Prostate and colorectal cancer	USA Community	NR	Male-specific	Purposive 64 men	African American and White 40 to 64 Both	Masculinity and health theory	IDI	Framework and thematic

Note:

NR = Not reported

Screening status = Ever-screened or never-screened or both

Characteristics of included quantitative studies (*k*=44)

First author and year	Disease for screening	Country and setting	Study year	Gender focus	Sampling and sample size	Ethnicity, age and screening status	Theory used	Data collection method	Response rate	P-value reported
Ashford 2001	Prostate Cancer	USA Healthcare setting and community	Feb 1995 – Jun 1996	Male-specific	Universal 723 men	African American 50 - 74 Both	Health Belief Model	Interview assisted survey	95% clinic, 65% community	No
Baseman 2001	Syphillis	USA Community	NR	Comparison	Purposive 446 men 245 women	Various >18 Both	NR	Interview assisted survey	NR	No
Bergenmar 1997	Melanoma	Sweden Community	1994	Comparison	Universal 61 men 66 women	Various 40 - 60 Both	Health Belief Model	Telephone interview	63%	No
Biadglegne 2011	HIV	Ethiopia Healthcare setting	Aug 2008 – Oct 2008	Comparison	Systematic 91 men 131 women	Various 18 - 70 Both	NR	Interview assisted survey	NR	Yes
Blanchard 2005	Prostate Cancer	USA NR	NR	Male-specific	Convenience 324 women	Various >18 NR	NR	Self-completion questionnaire	>90%	No

Blesch 1986	Testicular Cancer	USA Community	NR	Male-specific	Random 128 men	Various 20 - 60 Both	Health Belief Model	Self-completion questionnaire	55%	No
Bloom 2006	Prostate Cancer	USA Community	NR	Male-specific	Convenience 208 men	African American 40 - 74 Both	Health Belief Model	Interview assisted survey	50%	No
Bourne 2010	Prostate Cancer	Jamaica Healthcare setting	Feb 2008 – Mar 2008	Male-specific	Random 170 men	Various >29 Both	NR	Interview assisted survey	76.8%	No
Calazel-Benque 2011	Colorectal Cancer	France Community	Jan 2005 – Feb 2005, Dec 2007 – Jan 2008	Comparison	NR 270 men 305 women	Various 40 - 75 Both	NR	Telephone interview	NA	Yes
Cormier 2003	Prostate Cancer	USA Community	1995-2000	Male-specific	Convenience 138 men	Various 42 - 93 Both	NR	Postal questionnaire	89%	No
Cunningham 2009	Sexual transmitted disease	USA Community	Apr 2004 – Apr 2007	Comparison	Random 230 men 364 women	Various 15 - 24 Both	NR	Interview assisted survey	51%	No
Day 2003	HIV	South Africa Healthcare setting	Jul 2001	Male-specific	Systematic 105 men	Various 24 - 61 Both	NR	Interview assisted survey	95%	No
Demark-Wahnefried 1995	Prostate Cancer	USA Healthcare setting	1992	Male-specific	NR 1504 men	African American and White Median: 64 Ever-screened	NR	Self-completion questionnaire	NR	No

Elnicki 1995	Cardiovascular	USA Healthcare setting	1991	Comparison	Consecutive 75 men 113 women	Various 18 - 88 Both	NR	Interview assisted survey	100%	Yes
Farraye 2004	Colorectal Cancer	USA Healthcare setting	NR	Comparison	Purposive 241 men 300 women	Various 50 - 89 Both	NR	Postal questionnaire	56%	Yes
Foldspang 1990	HIV	Denmark Community	Oct 1998 – Dec 1988	Male-specific	Random 230 men	Danish 20 - 49 Both	NR	Postal questionnaire	77%	No
Green 2004	Colorectal Cancer	USA Community	NR	Comparison	Convenience 42 men 58 women	African American 50 - 90 Both	Health Belief Model	Self-completion questionnaire	NR	No
Iyaniwura 2006	HIV	Nigeria Community	Apr 2004 – May 2004	Comparison	Purposive 196 men 197 women	Various 15 - 29 Both	NR	Interview assisted survey	NR	No
Katz 1995	Testicular Cancer	USA Community	1993 – 1994	Male-specific	Convenience 78 men	Various mean =23 Both	NR	Self-completion questionnaire	NR	No
Larson 2005	Cancer	USA Community	Dec 2001 –Jul 2002	Comparison	Random 140 men 360 women	Various Men ≥50 Women ≥40 NR	NR	Telephone interview	72%	No
Li 1998	Colorectal Cancer	Japan Community	1991 – 1996	Comparison	Universal 182 men 174 women	Various 40 - 79 Never-screened	NR	Postal questionnaire	81%	Yes
Lin 2011	Prostate Cancer	Taiwan Community	Jun 2009 – Jan 2010	Male-specific	NR 330 men	Various 38 - 82 Both	NR	Self-completion questionnaire	NR	No
McCoy 1995	Prostate Cancer	USA Community	2 weeks over	Male-specific	Random 897 men	African American,	NR	Telephone interview	NR	No

			summer 1990			White and Hispanic >65 Both				
McDougall 2004	Prostate Cancer	USA Healthcare setting	NR	Male-specific	Convenience 19 men	African American 45 - 76 Ever-screened	NR	Self-completion questionnaire	NR	No
Mugisha 2010	HIV	Uganda Community	2007	Comparison	Random 66 men 61 women	Various 16 - 44 Both	NR	Interview assisted survey	NR	No
Naik 2012	HIV	South Africa Community	Sep 2009 – Jan 2011	Comparison	Systematic 560 men 111 women	Various 14 - 98 Never-screened	NR	Interview assisted survey	99%	Yes
Neale 1989	Colorectal Cancer	USA Community	1985	Male-specific	Universal 128 men	White mean =41 Never-screened	NR	Telephone interview	68%	No
Obermeyer 2009	HIV	Burkina Faso Healthcare setting	Jan 2006 – Feb 2006	Comparison	Convenience 63 men 236 women	Various mean =34 Both	NR	Interview assisted survey	100%	No
Oliver 2011	Prostate Cancer	USA Community	May 2007 – Aug 2007	Male-specific	Convenience 94 men	African American and White >40 Both	Health Belief Model	Self-completion questionnaire	100%	No
Paiva 2011	Prostate Cancer	Brazil Community	NR	Male-specific	Random 160 men	African American,	NR	Self-completion	NR	No

						White and Mestizo 50 - 80 Both		questionnaire		
Parchment 2004	Prostate Cancer	USA Community	NR	Male-specific	Convenience 100 men	African American and Caribbean men 37 - 89 Both	The Theory of Reasoned Action	Self-completion questionnaire	Low	No
Rafael 2012	Prostate Cancer	Brazil Healthcare setting	Jun 2011	Male-specific	Random 101 men	Various 40 - 59 Both	NR	Interview assisted survey	NR	No
Raich 1997	Prostate Cancer	USA Community	1994	Male-specific	Universal 436 men	Various Not clear Ever-screened	NR	Postal questionnaire	64%	No
Ramos 2011	Colorectal Cancer	Spain Healthcare setting	Jan 2009 – Jun 2009	Comparison	Systematic 261 men 361 women	Various 50 - 69 Both	NR	Self-completion questionnaire	95%	No
Sanders 2007	Sexual transmitted disease	USA Community	2004 – 2005	Comparison	NR 50 men 106 women	Various 14 - 20 Never-screened	Health Belief Model	Self-completion questionnaire	40.6%	No
Shelton 1999	Prostate Cancer	USA Community	NR	Male-specific	Purposive 1395 men	African American 40 - 70 Both	Theory of Planned Behavior	Self-completion questionnaire	NR	No
Tobin-west 2014	HIV	Nigeria Community	May 2011 – Jun 2011	Comparison	Random 267 men	Various >15	NR	Interview assisted	NR	Yes

					368 women	Both		survey		
Vernon 1990	Colorectal Cancer	USA Community	Spring 1988	Male-specific	Purposive 113 men	Various NR Both	NR	Telephone interview	80.7%	No
Vincent 2011	Colorectal Cancer	USA Community	Jan 2009 – Feb 2009	Comparison	Random 542 men 689 women	Various 50 - 80 Both	Transtheoretical Model	Postal questionnaire	30.85%	Yes
Watanabe 2004	HIV	Japan Healthcare setting	Apr 2001 – Mar 2002	Comparison	Universal 2515 men 1587 women	Various 19 - 70 Ever-screened	NR	Self-completion questionnaire	56.6%	No
Wong MC 2013	Colorectal Cancer	Hong Kong Healthcare setting	May 2008 – Sep 2012	Comparison	Consecutive 4384 men 5689 women	Various 50 - 70 Never-screened	Health Belief Model	Self-completion questionnaire	NR	Yes
Wong RK 2013	Colorectal Cancer	Singapore Community	2007 – 2008	Comparison	Random 693 men 1050 women	Various >50 Both	Health Belief Model	Interview assisted survey	88.2%	Yes
Zhou 2009	HIV	China Healthcare setting	Jul 2006 – Jun 2007	Comparison	NR 1957 men 719 women	Various 20 - 65 Ever-screened	NR	Interview assisted survey	35.6%	Yes
Zimmerman 1997	Prostate Cancer	USA Healthcare setting	1995	Male-specific	Convenience 51 men	Hispanic 35 - 78 Ever-screened	Social Marketing	Interview assisted survey	100%	No

Note:
NR = Not reported
Screening status = Ever-screened or never-screened or both

Characteristics of included mixed-method studies (*k*=6)

First author and year	Disease for screening	Country	Setting	Study year	Gender focus	Sampling and sample	Ethnicity, age and screening status	Theory used	Data collection method	Data Analysis
Bastani 2001 (QL)	Colorectal Cancer	USA	NR	Sep 1998 – Dec 1998	Comparison	Purposive 23 men 28 women	Various >50 NR	NR	FGD	Thematic
Bwambale 2008 (QL)	HIV	Uganda	Healthcare setting	Jan 2005 – Apr 2005	Male-specific	Purposive 40 men 10 women	Various >18 Both	NR	FGD and IDI	Thematic
Bwambale 2008 (QN)			Community			Random 780 men	Various 18 - 90 Both		Interview assisted survey	Response rate: NR P-value: No
Denberg 2005 (QL)	Colorectal Cancer	USA	Community	Mar 2004 – Apr 2004	Comparison	Convenience 25 men 27 women	Various >50 Never-screened	Grounded theory	IDI	Thematic
Jones RM 2010 (QL)	Colorectal Cancer	USA	Community	Dec 2005 – Jun 2006	Comparison	Convenience 15 men 25 women	Various 45 - 75 Both	NR	FGD	Thematic
Jones RM 2010 (QN)				Jun 2005 –Jul 2005		Random 103 men 201 women	Various 50 - 75 Both		Postal questionnaire	Response rate: 48% P-value: Yes
Katz 2004 (QL)	Colorectal Cancer	USA	Community	1998	Comparison	Convenience 3 grps men 3 grps women	African American >50 NR	NR	FGD	NR
Matterne 2008 (QL)	Colorectal Cancer	Germany	Community	NR	Male-specific	Convenience 71 men	Various 45 - 70 Both	Cues to Action	IDI	Thematic

Note:

NR = Not reported

Screening status = Ever-screened or never-screened or both

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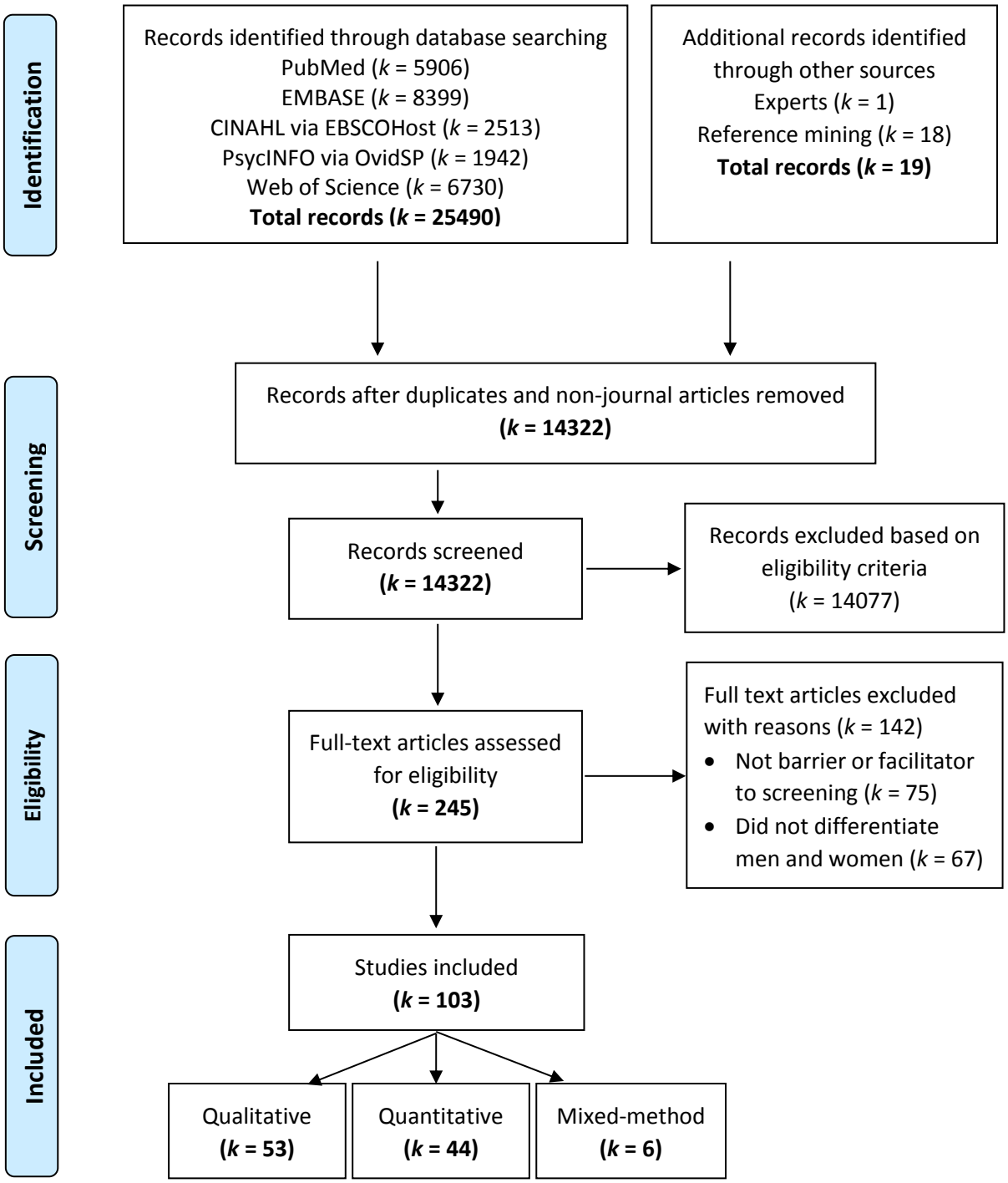

Fig. 1. PRISMA Flow Diagram.