

Running Head: Family History and PSA Testing

A Review of PSA Screening Prevalence and Risk Perceptions for First-Degree Relatives of Men  
with Prostate Cancer

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Abstract

*Objective:* First-degree relatives of men with prostate cancer have a higher risk of being diagnosed with prostate cancer than men without a family history. The present review examines: the prevalence and predictors of testing in first-degree relatives; perceptions of risk; prostate cancer knowledge; and psychological consequences of screening.

*Methods:* Medline, PsycInfo and Cinahl databases were searched for articles examining risk perceptions or screening practices of first-degree relatives of men with prostate cancer for the period 1990 to August 2007.

*Results:* Eighteen studies were eligible for inclusion. First-degree relatives participated in PSA testing more and perceived their risk of prostate cancer to be higher than men without a family history. Family history factors (e.g., being an unaffected son rather than an unaffected brother) were consistent predictors of PSA testing. Studies were characterised by sampling biases and a lack of longitudinal assessments.

*Conclusion:* Prospective, longitudinal assessments with well validated and comprehensive measures are needed to identify factors that cue the uptake of screening and from this develop an evidence base for decision support.

*Practice implications:* Men with a family history may benefit from targeted communication about the risks and benefits of prostate cancer testing that responds to the implications of their heightened risk.

*Keywords:* First-degree relatives; family history; prostate cancer; screening; PSA; review.

### 1. Introduction

Prostate cancer is one of the most frequently diagnosed cancers in men with 543,000 new cases diagnosed worldwide in 2000; representing over 10% of new cancers diagnosed in men each year [1, 2]. Although recently there has been a decrease in prostate cancer mortality, the incidence of prostate cancer remains high (e.g., 104 new cases per 100,000 men in North America) [1-3]. Further, the prevalence of this condition is certain to escalate over the next few years with ageing populations throughout most of the western world and an increasingly long natural history.

Much of the high familial rate of prostate cancer is due to hereditary factors that are thought to play a greater role in prostate cancer than in any other cancer [4]. Although there have been recent advances in the identification of prostate cancer susceptibility genes [5], a clearly identifiable gene has not yet been found. However, prostate cancer risk more than doubles for first-degree relatives of men with prostate cancer; and risk increases threefold when more than one first-degree relative has prostate cancer [6-8]. As well, the risk of being diagnosed with prostate cancer for first-degree relatives increases further when their relative is diagnosed prior to the age of 60 [7].

Problematically, genetic testing for prostate cancer susceptibility is not yet a practical option [9-11] and opinions differ as to whether prostate specific antigen (PSA) screening should be offered to all men with a family history [12-14]. In this regard, the efficacy of screening for the general population of men has not yet been confirmed as there is insufficient evidence to conclude that mortality will be reduced as a result of early detection [14-17]. The prostate-specific antigen (PSA) blood test used to detect prostate cancer has low specificity and sensitivity and does not differentiate between clinically significant and indolent cancers. Further,

there are competing causes of mortality for older men and treatment for prostate cancer carries with it enduring iatrogenic effects that range from erectile dysfunction and urinary incontinence to hot flushes, loss of bone substance and muscle mass, cognitive impairment and induced metabolic syndrome [12, 14, 15, 18]. Hence, it is broadly held by most professional and statutory bodies that screening should not be offered to asymptomatic men; but that men should be informed of the risks, benefits and uncertainties associated with prostate cancer screening and make individual decisions about testing for prostate cancer [14-17, 19].

However, while public health policies do not yet endorse screening for first-degree relatives, many family members seek testing [13, 20, 21]; and various clinicians and researchers propose that screening is likely to be beneficial for these high-risk men [12, 14, 22]. Consistent with this, Bermejo et al.[23] and Hemminki et al.[21] reported that following a diagnosis of prostate cancer in the family, siblings of an affected relative were more likely to be diagnosed with prostate cancer within the first five years of their brothers' diagnosis. Further, almost half of the brothers' diagnoses occurred within a year of the first diagnosis of prostate cancer in a sibling. These results suggest that having a family member diagnosed with prostate cancer prompts male family members to participate in prostate cancer screening. Accordingly, primary care physicians and health educators will increasingly need to respond to the information and decision support needs of these men as prostate cancer prevalence continues to rise and more men find themselves with a family history of prostate cancer.

In order to develop targeted and effective patient education materials and decision aids to help such men make informed decisions about testing, a clear understanding of the cues that prompts relatives to undergo testing is needed [24, 25]. The present review examines the prevalence of testing in first-degree relatives; predictors of testing; and perceptions of prostate

cancer risk. Knowledge about prostate cancer and the psychological effects of testing are also reviewed. From this, how a family history of prostate cancer influences first-degree male relatives' decisions about participating in screening is discussed. .

### **2. Methods**

Literature searches were conducted in CINAHL, Medline and PsycINFO for the period 1990 to August 2007. The search used combinations of keywords relating to: (a) prostate cancer; (b) a first-degree family history of prostate cancer (first-degree relative; family history; high-risk; son, father, brother or sibling); (c) prostate cancer screening (prostate specific antigen; early detection; preventive health); and (d) risk perceptions (perceived risk, susceptibility or vulnerability). An ancestry search of reference lists and a Web of Science cited reference search were conducted to identify any additional studies meeting the review criteria. Studies were included in the review if they specifically examined a sample of first-degree relatives of men with prostate cancer and on the risk perceptions or screening practices of first-degree relatives and were published in peer-reviewed journals in the English language. Studies were excluded if they examined primarily biomedical aspects of prostate cancer screening (e.g., examining PSA serum levels); prostate cancer diagnoses or hereditary or genetic testing for prostate cancer.

### **3. Results**

A total of 23 studies that examined the first-degree relatives of men with prostate cancer were identified as being eligible for inclusion in the review. The following were excluded on the basis of being not consistent with the aims of the review: two were qualitative and did not specifically examine men with a family history of prostate cancer [26, 27]; two focused on issues associated with genetic inheritance and genetic testing [28, 29]; and two studies described

overlapping results and therefore one was excluded [30]. The remaining 18 (see Table 1) met the inclusion criteria representing 16,390 participants (2,817 first-degree relatives).

### *3.1 Participants and Recruitment.*

The majority of studies (77%) recruited first-degree relatives through contact with their probands (affected relatives) who were often participating in prostate cancer programs or who were identifiable through national cancer registries [20, 31-43]. Three of these studies recruited participants for involvement in annual prostate cancer screening programs [36, 40, 41]. Four surveyed participants as part of population-based health surveys [43-46], Schnur et al.[47] recruited participants who attended for a prostate cancer screening appointment at a general urology clinic and Bloom et al.[32] obtained part of their sample through contact with African American community groups. Four studies examined participants who were recruited from or who were participating in projects associated with hereditary risk [20, 33, 34, 43]. Excluding studies examining annual screening program adherence or the psychological effects of the screening process, only Vadaparampil et al.[42] included a follow-up assessment. Beebe-Dimmer et al.[31] and Pruthi et al.[39] limited their assessment to brothers of men with prostate cancer. Further, fewer than half of the studies made direct comparisons between first-degree relatives and the general population.

### *3.2 Prostate cancer screening prevalence*

Eleven studies report screening prevalence for first-degree relatives (see Table 1). For those examining lifetime screening prevalence (e.g., have you *ever* participated in prostate cancer screening), most found that prevalence exceeded 50% [35, 38, 42, 44, 45] with the exception of

one study conducted in the UK [41] finding that just over 40% of first-degree relatives reported some previous PSA testing, and another finding that only 44% of African American men with a family history had ever screened [43]. Of those studies examining recent PSA testing prevalence, one reported that 56% of first-degree relatives had been tested within the last 12 months [46], 69% had been tested within the last two years [35] and 68% of first-degree relatives tested regularly [20]. According to one North American study [33], almost all first-degree relatives with hereditary risk of prostate cancer participated in prostate cancer screening (95%).

Three studies make direct comparisons between the screening prevalence rates of first-degree relatives and men from the general population [38, 45, 46] and only two report that first-degree relatives are more likely (1.5-2.2 times more likely) to have participated in prostate cancer screening [45, 46]. Two of the three studies examining screening prevalence for African American men reported that African American first-degree relatives were more likely to have participated in PSA testing (2.3-3.0 times more likely) than African American men without a family history [32, 44]. By contrast, Spencer et al.[46] reported that men with multiple high-risk factors (African American men who also have a family history) were no more likely to screen than men with just one high-risk factor. The one study that examined screening over a 14 month period reported that, of the first-degree relatives who reported having participated in prior prostate cancer screening at baseline (50%), 63% of these men also participated in screening within a 14 month follow-up assessment period [42].

### *3.3 Predictors of prostate cancer screening*

Eleven papers report on the predictors of prostate cancer screening. Older age predicted participation in prostate cancer screening in almost all studies that examined screening predictors

[32, 35, 37, 38, 40-42, 44, 46], as well as higher socio-economic factors [35, 41, 42, 44, 46].

Physician discussion and having regular access to healthcare were associated with increased screening [32, 35, 46]. Having undergone prostate cancer screening in the past predicted future prostate cancer screening intentions [37] and adherence to annual prostate cancer screening programs [41].

Although not all studies reported on the relationship between family history characteristics and study variables, the type of family history of prostate cancer among first-degree relatives predicted prostate cancer screening among men. Men were more likely to participate in screening if they had more than one first-degree relative with prostate cancer [20, 35, 40, 41]. Sons of men with prostate cancer were more likely to participate in prostate cancer screening than were brothers of men with prostate cancer [40], and younger brothers of men with prostate cancer were more likely to participate in screening than were older brothers [31].

### *3.4 Risk perceptions and screening behaviour*

Nine studies assessed first-degree relatives' perceptions of prostate cancer risk however not all studies reported the average risk perceptions for their samples. Three different types of measures were used to assess perceived risk. Five studies report risk perceptions measured by single-event probability scales (e.g., 0-100%; [20, 31, 37, 38, 47]) and these results suggest that on average, first-degree relatives perceive their lifetime risk of being diagnosed with prostate cancer to be around 50% and more than a third of first-degree relatives overestimated their lifetime risk. Three studies examine comparative risk perceptions (e.g., personal risk comparable to that of the average man; [20, 31, 35, 38]), reporting that the majority of first-degree relatives perceive their risk to be greater than that of the average man. However, approximately 40% of

first-degree relatives underestimate their risk as being the same as or less than the average man.

Risk perceptions were predicted by family history characteristics. Beebe-Dimmer et al.[31] found that brothers who were older than their affected sibling had lower risk perceptions than brothers who were younger than their affected sibling. Bratt et al. [20] reported that the number of relatives deceased from or diagnosed with prostate cancer increased risk perceptions. Only two studies used more reliable multiple-item measures to assess risk perceptions (e.g., 4-item summated scale measures that assess both comparative and numerical risk perceptions; [37, 42]) and these showed that first-degree relatives indicated greater perceived risk.

Three of the nine studies made direct comparisons between the risk perceptions of first-degree relatives and men from the general population [37, 38, 47]. These studies are consistent in reporting that first-degree relatives estimate both their comparative and lifetime risk as being higher than that reported by men from the general population. However, African American first-degree relatives did not have higher risk perceptions than African American men without a family history of prostate cancer [32]. Three studies found that higher risk perceptions were associated with increased screening [31, 37, 41] while three found that risk perceptions were not associated with increased screening in first-degree relatives [35, 38, 42].

### *3.5 Knowledge, beliefs and information needs*

Three studies examined first-degree relative's prostate cancer knowledge. One utilised a multiple-item measure to assess knowledge of a variety of issues associated with prostate cancer (e.g., prostate cancer anatomy, risk factors) and reported that prostate cancer knowledge was high among first-degree relatives [35]. However the assessment measure applied did not examine knowledge of screening efficacy. One study examined retrospective, perceived

knowledge (e.g., poor, fair, good) prior to and following a diagnosis of prostate cancer in a sibling [39]. Men who improved their self-assessed knowledge following their sibling's diagnosis were more likely to begin screening, and African American first-degree relatives were less likely to improve their knowledge [39]. However, 69% of first-degree relatives did not improve their prostate cancer knowledge and 85% did not begin participating in prostate cancer screening. The third study assessed whether or not there were differences in awareness of PSA testing between African American first-degree relatives and African American men without a family history of prostate cancer [44]. African American first-degree relatives were more likely to be aware of PSA testing than African American men without a family history [44].

First-degree relatives reported a need for more information about prostate cancer and prostate cancer screening. Jacobsen et al.[37] found that first-degree relatives were more likely to indicate that they would like to receive information about prostate cancer than men from the general population. Sweetman et al.[41] reported that men who stated that they agreed to participate in their screening program to get more information about prostate cancer were more likely to have participated in prostate cancer screening in the past.

### *3.6 Psychological effects of screening*

Participation in PSA testing appears to have little effect on anxiety, depression and health related quality of life (HRQOL) for first-degree relatives [34, 36]. One study reported no change in depression or anxiety during the screening process [34] while another stated that approximately 20% of first-degree relatives showed moderate deterioration in anxiety and a small deterioration in HRQOL [36]. Men with more than two relatives with prostate cancer, a

higher education, an anxious personality, no children living at home and between the ages of 50-60 years old were more likely to demonstrate deterioration in anxiety and HRQOL [36].

## **4. Discussion and Conclusions**

### *4.1. Discussion*

The findings of the review indicate that first-degree male relatives participate in screening more than men without a family history of prostate cancer and the prevalence of screening appears to be high. Such men have heightened risk perceptions however, their risk perceptions are often inaccurate with men both over- and underestimating their risk. Risk perceptions do not consistently predict screening with only half of the studies that examined the relationship between risk perceptions and screening finding that higher risk perceptions predicted screening. Rather, screening is predicted by older age, access to healthcare, higher socio-economic status, previous involvement in screening, having more than one first-degree relative with prostate cancer and the nature of the familial relationship with the affected relative. Specifically, being a younger versus an older sibling or a son as opposed to a brother of a family member with prostate cancer predicted screening. In summary, two key themes emerge as influencing the testing behaviour of these men. First, having a more extensive family history and a paternal rather than fraternal history was related to more testing, suggesting that the more personally significant the history, the greater the effect on behaviour. Second, socio-economic factors that influence access to health care also influence testing in first degree male relatives. This finding is consistent with research showing poorer prostate cancer treatment decisions and health outcomes for men who report socio-economic barriers and poorer access to health care [48-50].

Not surprisingly, the predictors of risk perceptions are similar to the factors that predict screening viz. having multiple first-degree relatives diagnosed with or deceased from prostate cancer; a paternal family history; or a younger versus an older sibling [20, 31]. These findings are of particular interest as brothers are at an actual greater risk of being diagnosed with prostate cancer than are sons [6, 7] and one of the main risk factors for being diagnosed with prostate cancer is older age. Thus, first-degree relatives may not have an accurate understanding of familial risk and may be making assumptions about risk based principally on the nature of their relationship to their affected relative. These results highlight the need to ensure first-degree relatives are appropriately counselled about their actual risk of being diagnosed with prostate cancer based on their individual family histories. Despite the finding that having a family history raises men's awareness of prostate cancer, actual knowledge has been poorly assessed. Specifically, researchers have relied on examining men's personal perceptions of their knowledge and the one study that did assess actual knowledge did not examine men's understanding of screening efficacy. Hence, it is unclear whether these men are making informed decisions about screening consistent with public health policies [51, 52]. Further, first-degree relatives report unmet needs for information about prostate cancer. In the light of inaccurate risk perceptions and these unmet needs it is proposed that work is needed to educate both the community and the families of men with prostate cancer about the implications of a family history of prostate cancer and the potential benefits and limitations of screening for first-degree relatives.

In interpreting the results of this review, there are a number of methodological issues that need to be taken into consideration. First, the different types of assessments of perceived risk led to differences in how men rated their prostate cancer risk. Approximately 40% of men

underestimated or overestimated their risk depending on the assessment of risk (e.g., comparative versus single-event probability scales, respectively). This finding is consistent with research showing that women estimating breast cancer risk overestimate their risk when utilising single-event probability scales and underestimate their risk when utilising comparative rating scales [53]. As different measures of risk perception have the capacity to influence the risk levels reported by first-degree relatives, it is important for future studies to utilise comprehensive and multiple-item measures to gauge less assessment-biased perceptions of risk. The different assessments of perceived risk may also provide some explanation as to why risk perceptions were not found to consistently predict screening for first-degree relatives.

Second, there were inconsistencies in the assessment of prevalence (e.g., have you *ever* participated in PSA testing vs. have you participated in PSA testing in the *last 12 months*; see Table 1), limiting the extent to which prevalence can be compared across studies. Where possible, screening prevalence assessments should examine comprehensive and consistent timeframes to enhance the potential for comparisons to be made between recent and lifetime screening prevalence across studies. As well, additional studies should utilise more population-based sampling methods as first-degree relatives recruited from prostate cancer screening programs may represent a biased sample of first-degree relatives. Third, the majority of studies have been retrospective limiting the conclusions that can be drawn from the data. Prospective studies are needed to identify predictors of prostate cancer screening clearly and to describe screening behaviours and psychological outcomes for these men over time.

Finally, as nine of the eleven studies examining screening prevalence were conducted on a North American sample of first-degree relatives, the generalisability of these findings to other countries may be limited. The uptake of PSA testing in the United Kingdom is lower than in

North America and there is a considerably greater incidence of prostate cancer in North America compared with the United Kingdom [2, 54, 55]. As well, a recent examination of clinical practice guidelines for prostate cancer screening found that national and international medical entities vary in their endorsement of prostate cancer screening [56]. Thus, there is the potential for attitudes towards prostate cancer screening to differ across these countries. Future research to assess cross-cultural differences in screening attitudes and behaviours for men with a family history of prostate cancer is needed.

### *4.2. Conclusion*

This review illustrates the need for additional research on first-degree relatives of men with prostate cancer to gauge the extent to which having a family history of prostate cancer influences screening and describe better the factors that lead such men to undergo screening. Although the literature suggests that men with a family history participate in PSA testing more than the general population and identify their higher risks of being diagnosed with prostate cancer, results are inconsistent. Socioeconomic factors and the nature of the family history appear to be influential for screening behaviour and risk perceptions. These men do not appear to experience negative psychological consequences as a result of testing but do report unmet needs for information. Prospective, longitudinal assessments that use both consistent and comprehensive measures of screening are needed to establish what factors cue the uptake of prostate cancer screening in these men and how they fare over time.

### *4.3. Practice Implications*

In order to develop effective educational materials and decision aids for men with a family history of prostate cancer it is essential to first understand what factors predict testing. This review found that consistent predictors of screening were aspects related to a first-degree

relative's personal family history. If a diagnosis of prostate cancer in the family is acting as a trigger for screening, it is important to ensure that first-degree relatives are appropriately informed about prostate cancer risk and screening following their relatives' diagnosis. For example, it may be beneficial for general practitioners and nurse counsellors to seek permission to approach first-degree relatives following a diagnosis of prostate cancer in the family to provide prostate cancer education and support to family members. As well, educational materials for patients should focus on ensuring that there is effective and accurate communication about familial risk with referral for in depth information and support tailored to the needs of family members.

Further, there may be some benefit in examining how families communicate about prostate cancer risk and how this relates to participation in prostate cancer screening. The influence of families on the performance of preventive health behaviours has been recognised; particularly the positive effect a partner can have on one's health status [57-59]. With research examining the possible familial aggregation of prostate cancer with other cancers in the family, such as breast cancer [11], the potential for cancer diagnoses in the family to prompt prostate cancer screening in male relatives could be of interest.

Finally, African American men with a family history of prostate cancer have multiple risk factors for developing prostate cancer: race and family history [32, 60]. Future research to determine both the individual and the combined influences of race and family history on risk perceptions and screening behaviours is needed, particularly in light of the greater barriers to general healthcare facing African American men by comparison to Caucasians [61].

**"I confirm all patient/personal identifiers have been removed or disguised so the patient/person(s) described are not identifiable and cannot be identified through the details of the story."**

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Table 1.  
Articles examining first-degree relatives of men with prostate cancer.

Reference	Country	Sample	PSA Screening Prevalence			Main Findings
Beebe-Dimmer et al. (2004)[31]	USA	• 111 FDR <sup>a</sup> brothers recruited through contact with affected sibling				<ul style="list-style-type: none"> <li>Majority perceived risk to be <math>\geq 50\%</math></li> <li>Younger brothers had higher risk estimates than brothers who were older than their affected sibling</li> <li>Long-term risk greater than short-term risk estimates</li> </ul>
Bock et al. (2003)[33]	USA	• 64 FDRs <sup>a</sup> of families participating in Prostate Cancer Genetics Project (PCGP) who had an affected father and an affected brother	FDR <sup>a</sup>	95%	ever	<ul style="list-style-type: none"> <li>Majority of unaffected men had prior PSA test</li> <li>Half of first-degree relatives received first PSA test prior to the age of 50 years</li> </ul>
Bratt et al. (2000)[20]	Sweden	• 110 FDR <sup>a</sup> recruited from prostate cancer families with 3+ connected cases of prostate cancer and who had pedigree consistent with hereditary prostate cancer	FDR <sup>a</sup>	68%	regularly	<ul style="list-style-type: none"> <li>Screening associated with the number of relatives with prostate cancer</li> <li>Majority of men estimated risk to be high with 40% overestimating their risk</li> <li>Risk associated with number of relatives deceased from prostate cancer</li> </ul>
Bratt et al. (2003)[34]	Sweden	• 57 FDR <sup>a</sup> participants in Bratt et al. (2000) who indicated that they screened frequently				<ul style="list-style-type: none"> <li>No significant experiences of psychological adverse effects as a result of participating in prostate cancer screening</li> </ul>
Cormier et al. (2003)[35]	USA	• 138 FDR <sup>a</sup> recruited through contact with affected relative	FDR <sup>a</sup>	72% 69%	ever last 2 years	<ul style="list-style-type: none"> <li>Perceived risk not associated with screening</li> <li>Age, having regular physician, number of men first-degree relatives knows with prostate cancer, knowledge of PSA, and discussing screening with physician predicted prostate cancer screening</li> </ul>
Cormier et al. (2002)[36]	France	<ul style="list-style-type: none"> <li>• 220 FDR<sup>a</sup> recruited through contact with affected relative</li> <li>• Recruited for screening program</li> </ul>				<ul style="list-style-type: none"> <li>Moderate deterioration in anxiety and minimal deterioration in health-related quality of life for 20% of first-degree relatives over the course of PSA screening process</li> </ul>
Jacobsen et al. (2004)[37]	USA	• 83 FDR <sup>a</sup> recruited through contact with affected relative and 83 GP <sup>b</sup> through peer nomination				<ul style="list-style-type: none"> <li>Perceived vulnerability to prostate cancer mediated relationship between family history and PSA intentions</li> <li>Intention to have PSA test predicted by number of past PSA tests, time since last PSA test and perceived vulnerability</li> </ul>
Miller et al. (2001)[38]	USA	• 56 FDR <sup>a</sup> recruited through contact with affected relative 100 GP <sup>b</sup> community group members	FDR <sup>a</sup> GP <sup>b</sup>	63% 61%	ever	<ul style="list-style-type: none"> <li>No difference in screening for first-degree relatives and general population men</li> <li>First-degree relatives had greater perceived</li> </ul>

## Family History and PSA Testing

Pruthi et al. (2006)[39]	USA	<ul style="list-style-type: none"> <li>• 112 FDR<sup>a</sup> recruited through contact with affected sibling (42% African American)</li> </ul>				<ul style="list-style-type: none"> <li>• vulnerability to prostate cancer and lower expectations about prevention of prostate cancer</li> <li>• 31% of brothers improve prostate cancer knowledge after their sibling's diagnosis</li> <li>• Improvements in knowledge predictive of screening</li> <li>• 85% of brothers did not begin screening</li> </ul>
Roumier et al. (2004)[40]	France	<ul style="list-style-type: none"> <li>• 640 FDR<sup>a</sup> recruited through contact with affected relative</li> <li>• Annual screening program (3 years)</li> </ul>				<ul style="list-style-type: none"> <li>• Men under 60 were 2.3 times more likely to participate in screening program; sons were 1.4 times more likely to participate than brothers; men with several relatives with prostate cancer 1.5 times more likely to participate</li> <li>• 88% adherence rate (69% initial participation rate)</li> </ul>
Schnur et al. (2006)[47]	USA	<ul style="list-style-type: none"> <li>• 33 FDR<sup>a</sup> and 176 GP<sup>b</sup> attendees at screening appointment in urology clinic</li> </ul>				<ul style="list-style-type: none"> <li>• Relationship between family history of prostate cancer and perceived risk of prostate cancer</li> <li>• Perceived risk of prostate cancer mediated relationship between family history of prostate cancer and prostate cancer worry</li> </ul>
Shah et al. (2007)[45]	USA	<ul style="list-style-type: none"> <li>• 226 FDR<sup>a</sup> and 3769 GP<sup>b</sup> sampled as part of a population-based health survey</li> </ul>	FDR <sup>a</sup> GP <sup>b</sup>	52%* 35%	ever	<ul style="list-style-type: none"> <li>• First-degree relatives aged 50+ years almost twice as likely to have participated in screening than general population men</li> </ul>
Spencer et al. (2006)[46]	USA	<ul style="list-style-type: none"> <li>• 492 FDR<sup>a</sup> and 8221 GP<sup>b</sup> sampled as part of a population-based health survey</li> </ul>	FDR <sup>a</sup> GP <sup>b</sup>	56%* 42%	last 12 months	<ul style="list-style-type: none"> <li>• First-degree relatives more likely to have participated in screening than general population men</li> <li>• Men with multiple high-risk factors (African American men with family history) no more likely to screen than were men with only one high-risk factor</li> </ul>
Sweetman et al. (2006)[41]	UK	<ul style="list-style-type: none"> <li>• 128 FDR<sup>a</sup> recruited through contact with affected relative</li> <li>• Recruited for screening program</li> </ul>	FDR <sup>a</sup>	41-46%	some previous	<ul style="list-style-type: none"> <li>• Past screening behaviour only reliable predictor of adherence to screening program</li> <li>• Prior screening associated with having a father and brother with prostate cancer, having realistic or elevated risk, higher perceived benefits of testing, higher social class, and agreeing to take part in screening program to get more information about prostate cancer</li> </ul>
Vadaparampil et al. (2004)[42]	USA	<ul style="list-style-type: none"> <li>• 82 FDR<sup>a</sup> recruited through contact with affected relative</li> </ul>	FDR <sup>a</sup>	50% 50%	at any time 14 month follow-up	<ul style="list-style-type: none"> <li>• 63% of men who had prior PSA test had a PSA test during 14 months follow-up</li> <li>• Risk perceptions did not predict prior or follow-up screening behaviour</li> </ul>

African American Studies						
Bloom et al. (2006)[32]	USA	<ul style="list-style-type: none"> <li>• 88 FDR<sup>a</sup> and 120 GP<sup>b</sup> recruited through contact with affected relative and peer nomination or from churches and African American social groups</li> </ul>	FDR <sup>a</sup>	3.03OR*	last 12 months	<ul style="list-style-type: none"> <li>• African American men with a family history of prostate cancer were more likely to report having a recent PSA test</li> <li>• First-degree relatives did not perceive their risk to be higher than men without a family history</li> </ul>
Ross et al. (2005)[44]	USA	<ul style="list-style-type: none"> <li>• 43 FDR<sup>a</sup> and 693 GP<sup>b</sup> sampled as part of a population-based health survey</li> </ul>	FDR <sup>a</sup> GP <sup>b</sup>	64%* 42-50%	ever	<ul style="list-style-type: none"> <li>• African American men with a family history of prostate cancer more likely to have heard of a PSA test and to have had a PSA test than African American men without a family history</li> </ul>
Weinrich (2006)[43]	USA	<ul style="list-style-type: none"> <li>• 134 FDR<sup>a</sup> participants in the African American Hereditary Prostate Cancer Study (AAHPC) who had 4+ relatives with prostate cancer and 411 GP<sup>b</sup> African American participants from population-based health survey (National Health Interview Survey; NHIS)</li> </ul>	FDR <sup>a</sup> GP <sup>b</sup>	44% 65%	ever	<ul style="list-style-type: none"> <li>• Comparison between screening prevalence in AAHPC participants and NHIS African American participants indicated that African American men with a strong family history of prostate cancer reported lower PSA testing behaviour</li> </ul>

<sup>a</sup> First-degree relatives

<sup>b</sup> General population men

\*Indicates significant difference in prevalence rates between first-degree relatives and general population men