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Lifestyle factors and prostate-specific antigen (PSA) testing in UK Biobank: Implications for epidemiological research

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ABSTRACT

Background: The central role of prostate-specific antigen (PSA) testing in the diagnosis of prostate cancer leads to the possibility that observational studies that report associations between risk factors and prostate cancer could be affected by detection bias. This study aims to investigate whether reported risk factors for prostate cancer are associated with PSA testing in a large middle-aged population-based cohort in the UK.

Methods: The cross-sectional association between a wide range of sociodemographic, lifestyle, dietary and health characteristics with PSA testing was examined in 212,039 men aged 40–69 years in UK Biobank.

Results: A total of 62,022 (29%) men reported they had ever had a PSA test. A wide range of factors was associated with a higher likelihood of PSA testing including age, height, education level, family history of prostate cancer, black ethnic origin, not being in paid/self-employment, living with a wife or partner, having had a vasectomy, being diagnosed with cancer or hypertension and having a high dietary intake of cereal, cooked and salad/raw vegetables, fresh fruit and tea. Conversely, socioeconomic deprivation, Asian ethnic origin, current smoking, low alcohol intake, high body-mass index, high coffee consumption and being diagnosed with diabetes, heart disease or stroke were associated with a lower likelihood of PSA testing.

Conclusions: A variety of sociodemographic, lifestyle and health-related characteristics are associated with PSA testing, suggesting that observed associations of some of these traits with risk for prostate cancer in epidemiological studies may be, at least partially, due to detection bias.

1. Introduction

The only well-established lifestyle and demographic risk factors for prostate cancer are advanced age, being of black ethnic origin and having a family history of the disease. A wide range of other sociodemographic, behavioural, dietary and health-related characteristics have also been reported to be associated with increased prostate cancer risk [1], although these findings are less well established between studies and across populations. This inconsistency may, in part, be due to detection bias if these characteristics are also associated with the likelihood of having had a prostate-specific antigen (PSA) test, which is a key part of the diagnostic pathway for prostate cancer.

Enhanced detection through PSA testing largely explains the increased incidence of prostate cancer over the last 20 years in many countries [2,3]. In the UK, although PSA testing is not currently recommended as a screening tool for prostate cancer [4], it is widely performed in primary care, either as a frontline test for men presenting with urinary tract/prostatic symptoms or as a free test for men aged ≥50 years at the request of the patient [5]. The aim of this study was to examine the associations between a wide range of sociodemographic, lifestyle and health-related characteristics and PSA testing in a large UK cohort without a routine screening programme, with a particular focus on established or possible risk factors for prostate cancer.

2. Material and methods

Participants were selected from UK Biobank, a large population-based cohort study that recruited 502,649 men and women aged

Abbreviations: BMI, body mass index; CI, confidence interval; OR, odds ratio; PSA, prostate-specific antigen.

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Table 1
Logistic regression models investigating the association between baseline characteristics and having had a PSA test.

Characteristic	Ever had a PSA test, No. (%)		Model A[a]		Model B[b]	
	No	Yes	OR (95% CI)	p-value	OR (95% CI)	p-value
Age group (years)						
40–44[c]	21,858 (95.5)	1,043 (4.6)	1 (Reference)		1 (Reference)	
45–49	25,299 (91.4)	2,391 (8.6)	1.98 (1.84–2.13)		1.99 (1.85–2.15)	
50–54	25,293 (81.3)	5,814 (18.7)	4.83 (4.51–5.17)		4.87 (4.54–5.21)	
55–59	25,611 (68.6)	11,734 (31.4)	9.64 (9.03–10.3)		9.64 (9.01–10.3)	
60–64	29,718 (58.6)	21,026 (41.4)	15.2 (14.2–16.2)		14.8 (13.8–15.8)	
65–70[d]	22,238 (52.6)	20,014 (47.4)	20.0 (18.7–21.4)	<0.001[e]	18.8 (17.6–20.2)	<0.001[e]
Townsend deprivation score (quintiles)						
One (most affluent)	27,997 (66.1)	14,377 (33.9)	1 (Reference)		1 (Reference)	
Two	28,870 (68.2)	13,472 (31.8)	0.92 (0.89–0.95)		0.93 (0.90–0.96)	
Three	29,718 (70.2)	12,648 (29.9)	0.87 (0.84–0.90)		0.90 (0.87–0.92)	
Four	30,752 (72.7)	11,579 (27.4)	0.84 (0.82–0.87)		0.88 (0.85–0.90)	
Five (most deprived)	32,461 (76.7)	9,885 (23.3)	0.75 (0.72–0.77)	<0.001[e]	0.84 (0.81–0.87)	<0.001[e]
Education						
No qualifications	24,503 (68.9)	11,037 (31.1)	1 (Reference)		1 (Reference)	
CSE/O-Level/GCSE or equivalent	21,540 (75.2)	7,111 (24.1)	1.16 (1.12–1.21)		1.08 (1.04–1.13)	
AS/A-Level or equivalent	7,764 (72.6)	2,926 (27.4)	1.32 (1.25–1.39)		1.16 (1.10–1.23)	
Higher education or other professional qualification, or equivalent	93,415 (70.1)	39,858 (29.9)	1.42 (1.39–1.46)	<0.001[e]	1.27 (1.23–1.31)	<0.001[e]
Region						
London	18,858 (67.6)	9,031 (32.38)	1 (Reference)		1 (Reference)	
South-West	11,671 (65.4)	6,187 (34.7)	1.02 (0.97–1.06)		1.08 (1.03–1.13)	
South-East	12,491 (69.1)	5,595 (30.9)	0.79 (0.75–0.82)		0.86 (0.82–0.90)	
Wales	5,778 (65.0)	3,116 (35.0)	1.05 (1.00–1.11)		1.16 (1.10–1.23)	
West Midlands	14,404 (71.7)	5,674 (28.3)	0.74 (0.71–0.77)		0.79 (0.75–0.82)	
East Midlands	10,743 (74.8)	3,616 (25.2)	0.55 (0.53–0.58)		0.59 (0.56–0.63)	
Yorkshire & Humber	22,814 (72.6)	8,604 (27.4)	0.67 (0.64–0.69)		0.71 (0.68–0.74)	
North-West	24,415 (71.7)	9,647 (28.3)	0.72 (0.70–0.75)		0.78 (0.75–0.82)	
North-East	18,159 (74.0)	6,373 (26.0)	0.62 (0.60–0.65)		0.67 (0.64–0.70)	
Scotland	10,684 (71.9)	4,179 (28.1)	0.74 (0.70–0.77)	<0.001[f]	0.82 (0.78–0.86)	<0.001[f]
Population density						
Urban	128,703 (71.2)	52,093 (28.8)	1 (Reference)		1 (Reference)	
Rural	19,457 (67.4)	9,404 (32.6)	1.01 (0.98–1.04)	0.52	1.01 (0.98–1.04)	0.49
Family history of prostate cancer						
No	138,451 (71.9)	54,205 (28.1)	1 (Reference)		1 (Reference)	
Brother or father	9,114 (57.8)	6,665 (42.2)	1.96 (1.89–2.03)		1.92 (1.86–2.00)	
Brother and father	93 (27.4)	247 (72.7)	5.21 (4.06–6.69)	<0.001[e]	5.32 (4.13–6.85)	<0.001[e]
Ethnicity						
White	140,176 (70.2)	59,570 (29.8)	1 (Reference)		1 (Reference)	
Mixed background	805 (78.8)	217 (21.2)	1.11 (0.94–1.31)		1.07 (0.91–1.26)	
Black	2,433 (77.8)	695 (22.2)	1.36 (1.24–1.50)		1.29 (1.17–1.41)	
Asian	4,506 (82.9)	927 (17.1)	0.68 (0.63–0.73)		0.65 (0.60–0.71)	
Other	1,460 (80.7)	350 (19.3)	0.97 (0.85–1.10)	<0.0001[f]	0.95 (0.83–1.08)	<0.001[f]
Employment						
Paid/self-employment	100,556 (77.3)	29,459 (22.7)	1 (Reference)		1 (Reference)	
Not in paid/self-employment	48,040 (60.0)	32,043 (40.0)	1.07 (1.04–1.09)	<0.001	1.14 (1.11–1.16)	<0.001
Lives with a wife or partner						
No	26,801 (74.6)	9,140 (25.4)	1 (Reference)		1 (Reference)	
Yes	112,178 (69.1)	50,170 (30.9)	1.23 (1.20–1.27)	<0.001	1.21 (1.17–1.24)	<0.001
Smoking						
Never	75,246 (72.1)	29,084 (27.9)	1 (Reference)		1 (Reference)	
Former	53,248 (66.1)	27,351 (33.9)	1.01 (0.99–1.03)		1.00 (0.98–1.02)	
Current—Only occasionally	5,677 (76.2)	1,775 (23.8)	0.91 (0.85–0.96)		0.88 (0.83–0.94)	
Current—On all or most Days	15,298 (81.1)	3,567 (18.9)	0.65 (0.63–0.68)	<0.001[f]	0.67 (0.64–0.70)	<0.001[f]
Alcohol intake						
Never	9,813 (73.8)	3,481 (26.2)	0.95 (0.91–0.99)		1.00 (0.95–1.04)	
Special occasions only	11,304 (73.6)	4,064 (26.4)	0.92 (0.88–0.96)		0.94 (0.90–0.98)	
One to three times a month	14,038 (74.7)	4,750 (25.3)	0.95 (0.91–0.99)		0.96 (0.92–1.00)	
Once or twice a week	39,956 (72.7)	15,010 (27.3)	1 (Reference)		1 (Reference)	
Three or four times a week	38,966 (70.1)	16,596 (29.9)	1.03 (1.00–1.06)		1.01 (0.98–1.03)	