

QCancer® -2013

Results Tables to accompany paper on cancers in men in British Journal General Practice January 2013

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Table 1 Baseline characteristics of men in the derivation and validation cohorts. Figures in the tables are counts (%) unless otherwise specified.

	derivation	*validation*
Total men	1263071	679174
mean age (SD)	48 (16.1)	47.9 (16.1)
BMI recorded	833205 (66.0)	432652 (63.7)
mean BMI	26.2 (4.1)	26.2 (4.1)
mean deprivation score	-.3 (3.4)	-.1 (3.5)
smoking status		
non smoker	475266 (37.6)	252859 (37.2)
ex-smoker	245479 (19.4)	121964 (18.0)
Current: amount not recorded	46656 (3.7)	25530 (3.8)
light (<10/day)	82564 (6.5)	42330 (6.2)
moderate (10-19/day)	90649 (7.2)	48434 (7.1)
heavy (20+/day)	74769 (5.9)	40021 (5.9)
smoking not recorded	247688 (19.61)	148036 (21.80)
Alcohol intake		
non drinker	169927 (13.5)	89840 (13.2)
Trivial <1 unit/day	271223 (21.5)	136079 (20.0)
Light 1-2 units/day	293502 (23.2)	149000 (21.9)
Moderate 3+units/day	138294 (10.9)	70110 (10.3)
alcohol not recorded	390125 (30.9)	234145 (34.5)
medical and family history		
prior cancer	26884 (2.1)	13,977 (2.1)
Family history of GI cancer	13201 (1.0)	6646 (1.0)
family history of prostate cancer	1323 (0.1)	654 (0.1)
chronic pancreatitis	1340 (0.1)	747 (0.1)
COPD	25428 (2.0)	13217 (1.9)
type 1 diabetes	4693 (0.4)	2364 (0.3)
type 2 diabetes	46719 (3.7)	25209 (3.7)
Investigations		
Anaemia (HB < 11g/DL)	12046 (1.0)	6031 (0.9)

Table 2 Frequency of 'red flag' and recent general symptoms in men in the derivation and validation cohort. Numbers are frequencies (%).

	derivation		*Validation*	
	(%)		*(%)*	
Red flag symptoms				
venous thrombo-embolism	9073	(0.7)	4603	(0.7)
abdominal distension	2340	(0.2)	1145	(0.2)
abdominal pain	91476	(7.2)	47032	(6.9)
appetite loss	4234	(0.3)	1887	(0.3)
heartburn	8846	(0.7)	4388	(0.6)
indigestion	42367	(3.4)	21893	(3.2)
dysphagia	7088	(0.6)	3553	(0.5)
haematemesis	7380	(0.6)	3803	(0.6)
rectal bleeding	27446	(2.2)	14006	(2.1)
haematuria	26230	(2.1)	13527	(2.0)
haemoptysis	7065	(0.6)	3559	(0.5)
neck lump	3758	(0.3)	1967	(0.3)
weight loss	11197	(0.9)	5860	(0.9)
night sweats	2264	(0.2)	1164	(0.2)
haematospermia	2848	(0.2)	1441	(0.2)
testicular pain	5571	(0.4)	2809	(0.4)
testicular lump	8709	(0.7)	4329	(0.6)
Recent general symptoms				
nausea	3762	(0.3)	1636	(0.2)
change in bowel habit	2614	(0.2)	1321	(0.2)
constipation	10892	(0.9)	5638	(0.8)
diarrhoea	17936	(1.4)	9073	(1.3)
back pain	41216	(3.3)	21725	(3.2)
bruising	975	(0.1)	470	(0.1)
cough	37745	(3.0)	19338	(2.8)
dyspnoea	9898	(0.8)	4780	(0.7)
fever	3830	(0.3)	1741	(0.3)
itching	2066	(0.2)	1122	(0.2)
tiredness	12370	(1.0)	6132	(0.9)
headache	14844	(1.2)	7882	(1.2)
urinary incontinence	2141	(0.2)	1033	(0.2)
urinary dribbling	457	(0.0)	230	(0.0)
impotence	12299	(1.0)	6353	(0.9)
hesitancy	509	(0.0)	236	(0.0)
poor stream	357	(0.0)	188	(0.0)
nocturia	3287	(0.3)	1806	(0.3)
urgency	1109	(0.1)	526	(0.1)
urinary frequency	5147	(0.4)	2638	(0.4)
urinary retention	3113	(0.2)	1594	(0.2)

Table 3 numbers (%) men with cancer outcomes in the derivation and validation samples

	Derivation(%)		*Validation (%)*	
total patients	**1,263,071**		**679,174**	
no cancer	1,240,550	98.2	667,261	98.2
any cancer	22,521	1.8	11,913	1.8
cancer type				
lung cancer	3,351	14.9	1,761	14.8
colorectal cancer	3,250	14.4	1,725	14.5
gastro-oesophageal	2,212	9.8	1,174	9.9
pancreatic cancer	732	3.3	405	3.4
renal tract cancer	2,579	11.5	1,333	11.2
prostate cancer	4,640	20.6	2,477	20.8
blood cancer	1,664	7.4	896	7.5
testicular cancer	437	1.9	225	1.9
other cancer	3,656	16.2	1,917	16.1

Table 4 Mapping of significant symptoms to cancer type in the derivation cohort. + denotes a significant association on multivariate analysis

	blood	colorectal	gastro	lung	other	pancreas	prostate	renal	testis	total
Abdominal distension	+	+			+					3
Abdominal pain	+	+	+	+	+	+	+	+		8
Anaemia	+	+	+	+	+					5
Appetite loss	+	+	+	+	+	+	+			7
Change in bowel habit		+			+					2
Constipation		+			+	+				3
Cough				+						1
Dysphagia	+		+	+	+	+				5
Frequency							+			1
Haematemesis			+		+	+				3
Haematuria	+				+		+	+		4
Haemoptysis	+			+	+					3
Heartburn			+							1
Impotence							+			1
Indigestion	+		+	+	+	+				5
Neck lump	+		+	+	+					4
Night sweats	+			+				+		3
Nocturia							+			1
Rectal bleed		+					+			2
Retention							+			1
Testicular lump	+						+		+	3
Testicular pain							+		+	2
VTE	+			+	+	+	+		+	6
Weight loss	+	+	+	+	+	+	+	+		8
Grand Total	13	8	9	11	14	8	12	4	3	82

Table 5 adjusted risk ratios (95% CI) in the final model for symptoms and risk factors for cancers in men in the derivation cohort.
Risk ratios adjusted for other terms in table for each cancer and also adjusted for fractional polynomial terms for age and BMI:

factor	*Adjusted risk ratio[1] (95% CI)*
Prostate cancer	
family history of prostate cancer	3.63 (2.07 to 6.35)
abdominal pain	1.56 (1.43 to 1.70)
appetite loss	1.41 (1.04 to 1.91)
haematuria	4.43 (4.09 to 4.80)
rectal bleeding	1.42 (1.21 to 1.66)
testicular pain	1.89 (1.25 to 2.87)
testicular lump	1.88 (1.40 to 2.54)
venous thrombo-embolism	1.78 (1.48 to 2.13)
weight loss	2.12 (1.81 to 2.49)
impotence	1.45 (1.19 to 1.76)
nocturia	2.82 (2.34 to 3.40)
urinary frequency	2.02 (1.67 to 2.45)
urinary retention	2.35 (1.98 to 2.77)
Townsend score	0.979 (0.97 to .988)
Testicular cancer	
testicular pain	15.5 (10.3 to 23.4)
testicular lump	185 (153 to 224)
venous thrombo-embolism	9.41 (4.37 to 20.3)
Blood cancers	
anaemia	6.62 (5.7 to 7.69)
abdominal distension	2.32 (1.31 to 4.13)
abdominal pain	1.86 (1.62 to 2.14)
appetite loss	2.91 (2.06 to 4.11)
dysphagia	1.72 (1.16 to 2.54)
haematuria	1.59 (1.27 to 1.97)
haemoptysis	2.59 (1.82 to 3.67)
indigestion	1.76 (1.44 to 2.14)
neck lump	23.5 (18.9 to 29.2)
night sweats	4.57 (2.82 to 7.42)
testicular lump	2.71 (1.79 to 4.1)
venous thrombo-embolism	1.85 (1.36 to 2.5)
weight loss	3.40 (2.72 to 4.24)
Townsend score	.973 (.958 to .988)
Colorectal cancer	
anaemia	4.08 (3.65 to 4.57)
family history GI cancer	1.5 (1.15 to 1.95)
Alcohol: none	1.00
alcohol: Trivial <1 unit/day	1.07 (.956 to 1.2)
alcohol: Light 1-2 unit/day	1.34 (1.19 to 1.5)

alcohol: Moderate 3+units/day	1.56 (1.36 to 1.77)
abdominal distension	3.89 (2.77 to 5.45)
abdominal pain	4.56 (4.20 to 4.96)
appetite loss	1.72 (1.21 to 2.45)
rectal bleeding	17.9 (16.5 to 19.4)
weight loss	3.03 (2.52 to 3.64)
change in bowel habit	3.66 (2.93 to 4.56)
constipation	1.26 (1.06 to 1.49)
Gastro-oesophageal cancer	
anaemia	3.02 (2.62 to 3.49)
Non-smoker	1.00
ex-smoker	1.42 (1.28 to 1.59)
light (<10/day)	1.89 (1.59 to 2.24)
moderate (10-19/day)	1.92 (1.60 to 2.30)
heavy (20+/day)	1.87 (1.50 to 2.34)
abdominal pain	2.80 (2.49 to 3.14)
appetite loss	3.28 (2.41 to 4.45)
dysphagia	45.8 (41.3 to 51.0)
haematemesis	6.33 (5.25 to 7.63)
heartburn	3.23 (2.40 to 4.35)
indigestion	6.58 (5.86 to 7.39)
neck lump	2.32 (1.22 to 4.41)
weight loss	4.35 (3.61 to 5.24)
Lung cancer	
COPD	1.74 (1.58 to 1.91)
anaemia	2.28 (2.00 to 2.60)
Non-smoker	1.00
ex-smoker	2.32 (2.08 to 2.58)
light (<10/day)	4.47 (3.90 to 5.11)
moderate (10-19/day)	5.51 (4.77 to 6.38)
heavy (20+/day)	6.61 (5.74 to 7.61)
abdominal pain	1.49 (1.34 to 1.66)
appetite loss	2.11 (1.65 to 2.71)
dysphagia	2.83 (2.30 to 3.50)
haemoptysis	16.8 (15.1 to 18.7)
indigestion	1.31 (1.11 to 1.54)
neck lump	3.02 (2.02 to 4.53)
night sweats	2.20 (1.35 to 3.60)
venous thrombo-embolism	2.22 (1.81 to 2.73)
weight loss	3.95 (3.46 to 4.51)
cough	1.67 (1.48 to 1.89)
Townsend score	1.03 (1.02 to 1.04)
Other cancers	
COPD	1.27 (1.12 to 1.43)
type2 diabetes	1.27 (1.14 to 1.41)
anaemia	2.66 (2.33 to 3.02)

Non-smoker	1.00
ex-smoker	1.14 (1.05 to 1.24)
light (<10/day)	1.52 (1.33 to 1.73)
moderate (10-19/day)	1.50 (1.30 to 1.72)
heavy (20+/day)	1.70 (1.47 to 1.95)
abdominal distension	2.06 (1.37 to 3.09)
abdominal pain	2.31 (2.12 to 2.52)
appetite loss	3.21 (2.55 to 4.03)
dysphagia	2.93 (2.37 to 3.61)
haematemesis	1.56 (1.23 to 1.99)
haematuria	1.7 (1.46 to 1.96)
haemoptysis	1.91 (1.46 to 2.5)
indigestion	1.37 (1.18 to 1.59)
neck lump	19.1 (16.2 to 22.4)
venous thrombo-embolism	2.99 (2.51 to 3.57)
weight loss	2.87 (2.45 to 3.37)
change in bowel habit	1.66 (1.16 to 2.37)
constipation	1.83 (1.57 to 2.14)
Pancreatic cancer	
chronic pancreatitis	2.69 (1.19 to 6.09)
type2 diabetes	2.10 (1.72 to 2.55)
Non-smoker	1.00
ex-smoker	1.32 (1.10 to 1.58)
light (<10/day)	1.36 (1.00 to 1.85)
moderate (10-19/day)	1.76 (1.30 to 2.38)
heavy (20+/day)	2.17 (1.60 to 2.96)
abdominal pain	8.59 (7.39 to 9.99)
appetite loss	4.17 (2.68 to 6.47)
dysphagia	2.50 (1.44 to 4.35)
haematemesis	2.69 (1.67 to 4.31)
indigestion	3.61 (2.87 to 4.54)
venous thrombo-embolism	3.24 (2.10 to 4.98)
weight loss	7.74 (6.00 to 9.99)
constipation	1.87 (1.4 to 2.49)
Townsend score	.965 (.943 to .988)
Renal tract cancer	
Non-smoker	1.00
ex-smoker	1.52 (1.38 to 1.68)
light (<10/day)	1.88 (1.61 to 2.21)
moderate (10-19/day)	2.19 (1.85 to 2.60)
heavy (20+/day)	2.62 (2.19 to 3.13)
abdominal pain	1.84 (1.59 to 2.12)
haematuria	64.0 (58.5 to 70.1)
night sweats	2.86 (1.44 to 5.68)
weight loss	1.98 (1.46 to 2.68)

[1] All hazard ratios adjusted for fractional polynomial terms for age and bmi, the terms were: age ln(age) and bmi[-2], bmi

Table 6 ROC statistics (95% CI) for the multinomial prediction algorithms in men aged 25-89 years in the validation sample. The individual model figures refer to the published QCancer models developed using individual cancer outcomes[4-9]

	men (multinomial model)	*men (individual models)*
any cancer	0.886(0.883 to 0.888)	
lung	0.919(0.914 to 0.924)	0.92 (0.91 to 0.93)
colorectal	0.904(0.897 to 0.911)	0.906 (0.899 to 0.913)
gastro	0.926(0.918 to 0.933)	0.92 (0.91 to 0.93)
pancreas	0.889(0.873 to 0.906)	0.87 (0.85 to 0.88)
renal	0.939(0.932 to 0.946)	0.95 (0.94 to 0.96)
prostate	0.902(0.898 to 0.906)	n/a
blood	0.827(0.814 to 0.840)	n/a
testis	0.818(0.787 to 0.850)	n/a
other	0.856(0.847 to 0.865)	n/a

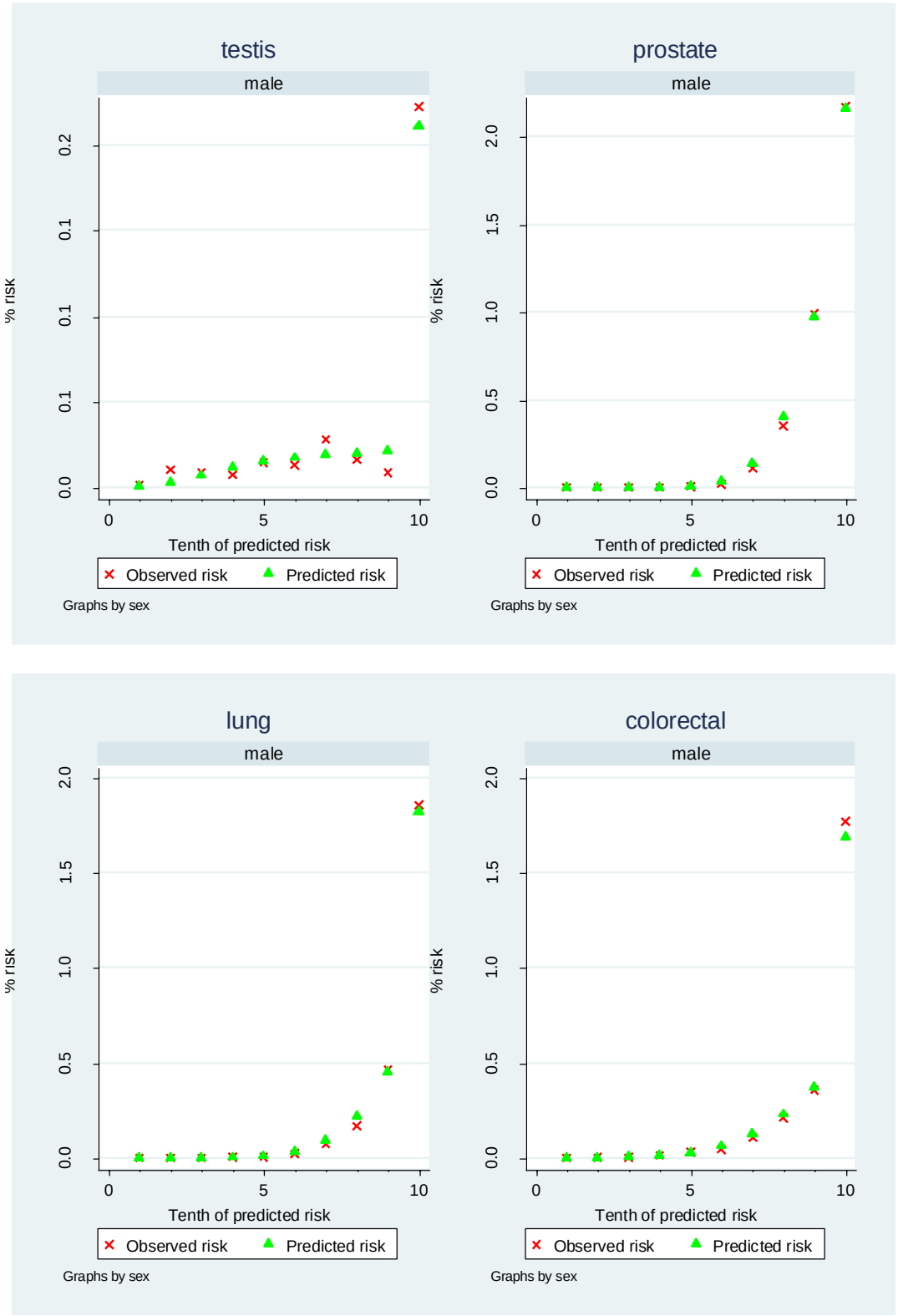
Table 7: comparison of strategies to identify men at risk of having a diagnosis of cancer based on the validation cohort.

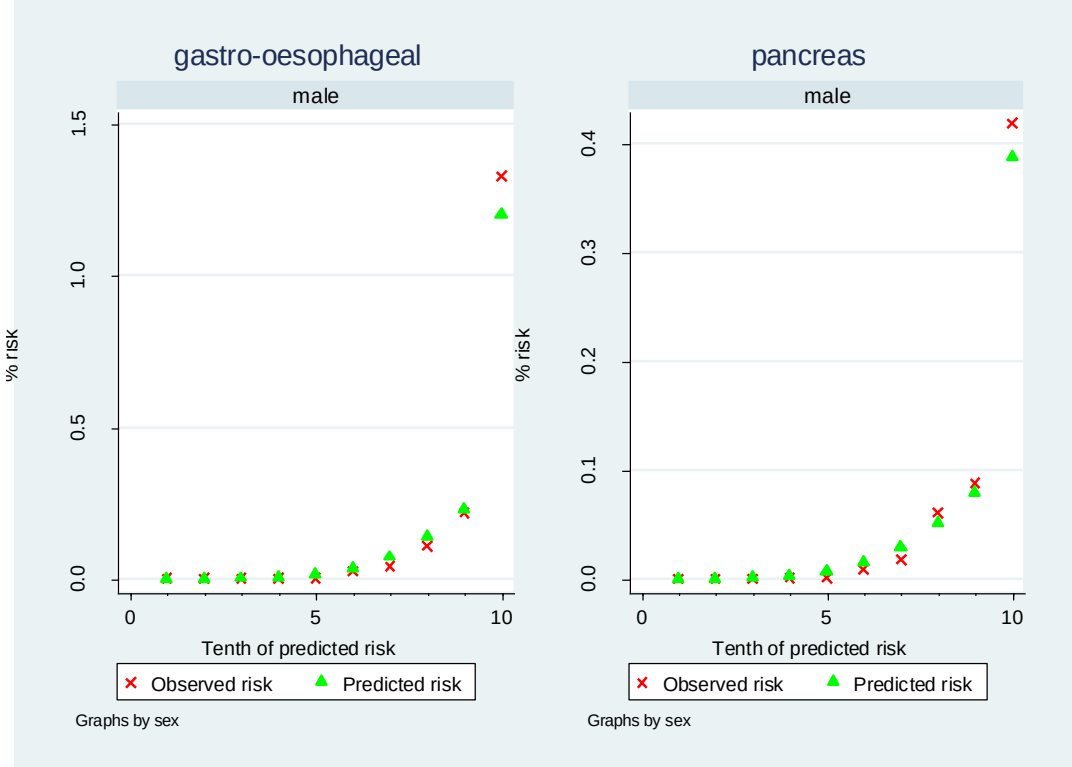
	true negative	false negative	false positive	True positive	Sensitivity (%)	specificity (%)	PPV (%)	NPV (%)
anaemia	662,349	10,794	4,912	1,119	9.4	99.3	18.6	98.4
VTE	662,946	11,625	4,315	288	2.4	99.4	6.3	98.3
abdominal distension	666,184	11,845	1,077	68	0.6	99.8	5.9	98.3
abdominal pain	622,125	10,017	45,136	1,896	15.9	93.2	4.0	98.4
appetite loss	665,536	11,751	1,725	162	1.4	99.7	8.6	98.3
heartburn	662,985	11,801	4,276	112	0.9	99.4	2.6	98.3
indigestion	646,129	11,152	21,132	761	6.4	96.8	3.5	98.3
dysphagia	664,180	11,441	3,081	472	4.0	99.5	13.3	98.3
haematemesis	663,692	11,679	3,569	234	2.0	99.5	6.2	98.3
rectal bleeding	654,033	11,135	13,228	778	6.5	98.0	5.6	98.3
haematuria	655,424	10,223	11,837	1,690	14.2	98.2	12.5	98.5
haemoptysis	664,047	11,568	3,214	345	2.9	99.5	9.7	98.3
neck lump	665,492	11,715	1,769	198	1.7	99.7	10.1	98.3
weight loss	662,037	11,277	5,224	636	5.3	99.2	10.9	98.3
night sweats	666,135	11,875	1,126	38	0.3	99.8	3.3	98.2
testicular pain	664,485	11,880	2,776	33	0.3	99.6	1.2	98.2
testicular lump	663,137	11,708	4,124	205	1.7	99.4	4.7	98.3
change in bowel habit	666,056	11,797	1,205	116	1.0	99.8	8.8	98.3
constipation	662,134	11,402	5,127	511	4.3	99.2	9.1	98.3
cough	648,590	11,246	18,671	667	5.6	97.2	3.4	98.3
bruising	666,815	1,189	446	24	2.0	99.9	5.1	99.8
impotence	661,059	11,762	6,202	151	1.3	99.1	2.4	98.3
nocturia	665,602	11,766	1,659	147	1.2	99.8	8.1	98.3
urinary frequency	664,764	11,772	2,497	141	1.2	99.6	5.3	98.3
urinary retention	665,887	11,693	1,374	220	1.8	99.8	13.8	98.3
Top 10% risk	606,404	4,853	60,857	7,060	59.3	90.9	10.4	99.2
Top 5% risk	638,270	6,946	28,991	4,967	41.7	95.7	14.6	98.9
Top 1% risk	661,966	10,417	5,295	1,496	12.6	99.2	22.0	98.5

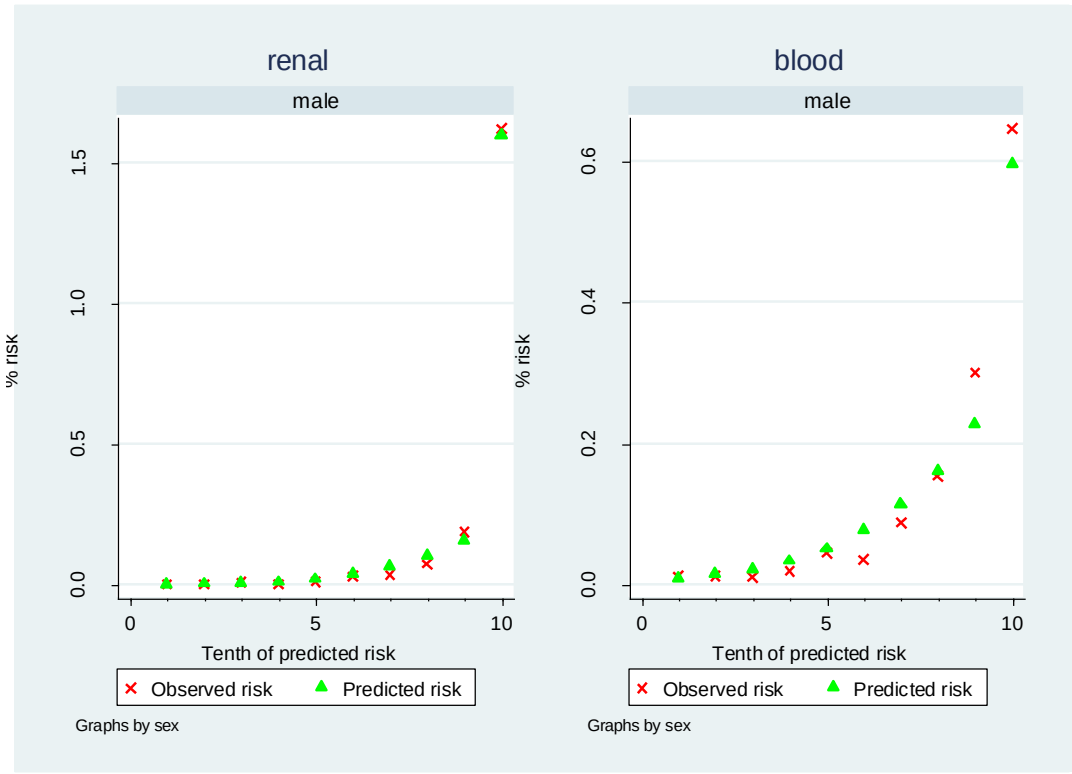
Table 8:comparison of strategies to identify men at risk of having a diagnosis of different types of cancer based on the top 10% at highest risk for each cancer in the validation cohort.

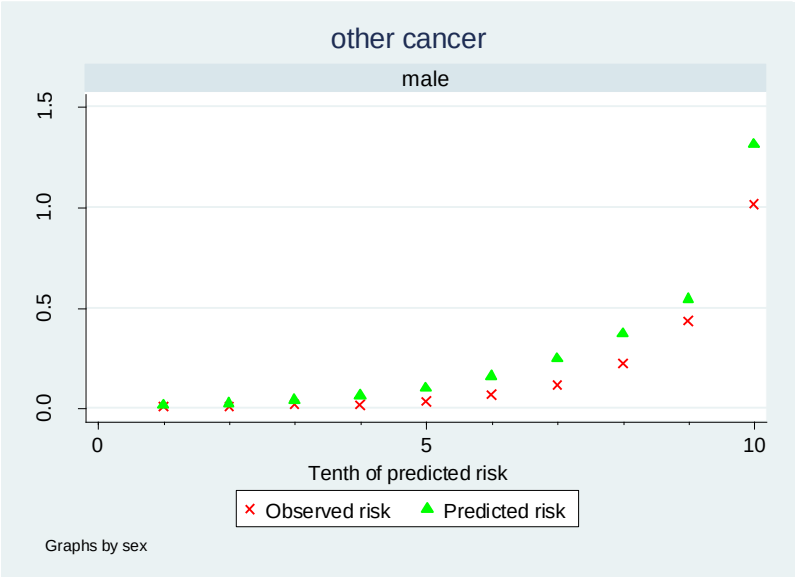
	% threshold	true negative	false negative	false positive	True positive	Sensitivity (%)	specificity (%)	PPV (%)	NPV (%)
top 10% risk of lung cancer	0.67	610,755	502	66,658	1,259	71.5	90.2	1.9	99.9
top 10% risk of colorectal cancer	0.45	610,731	526	66,718	1,199	69.5	90.2	1.8	99.9
top 10% risk of gastro-oesophageal	0.29	610,982	275	67,018	899	76.6	90.1	1.3	100.0
top 10% risk of pancreatic cancer	0.10	611,136	121	67,633	284	70.1	90.0	0.4	100.0
top 10% risk of renal tract cancer	0.20	611,026	231	66,815	1,102	82.7	90.1	1.6	100.0
top 10% risk of prostate cancer	1.30	610,254	1,003	66,443	1,474	59.5	90.2	2.2	99.8
top 10% risk of blood cancer	0.27	610,800	457	67,478	439	49.0	90.1	0.6	99.9
top 10% risk of testicular cancer	0.02	611,183	74	67,766	151	67.1	90.0	0.2	100.0
top 10% risk of other cancer	0.66	611,065	192	67,846	71	27.0	90.0	0.1	100.0

Figure 1 Mean predicted risk and observed risk of each cancer in the validation cohort




gastro-oesophageal
male
% risk
0.0
0.5
1.0
1.5
0
5
10
Tenth of predicted risk
Observed risk
Predicted risk
Graphs by sex
pancreas
male
% risk
0.0
0.1
0.2
0.3
0.4
0
5
10
Tenth of predicted risk
Observed risk
Predicted risk
Graphs by sex


renal
male
% risk
0.0
0.5
1.0
1.5
0
5
10
Tenth of predicted risk
Observed risk
Predicted risk
Graphs by sex
blood
male
% risk
0.0
0.2
0.4
0.6
0
5
10
Tenth of predicted risk
Observed risk
Predicted risk
Graphs by sex


other cancer
male
1.5
1.0
0.5
0.0
0
5
10
Tenth of predicted risk
Observed risk
Predicted risk
Graphs by sex