OCM_figurestables

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Figure 1: NHANES sample exclusions:
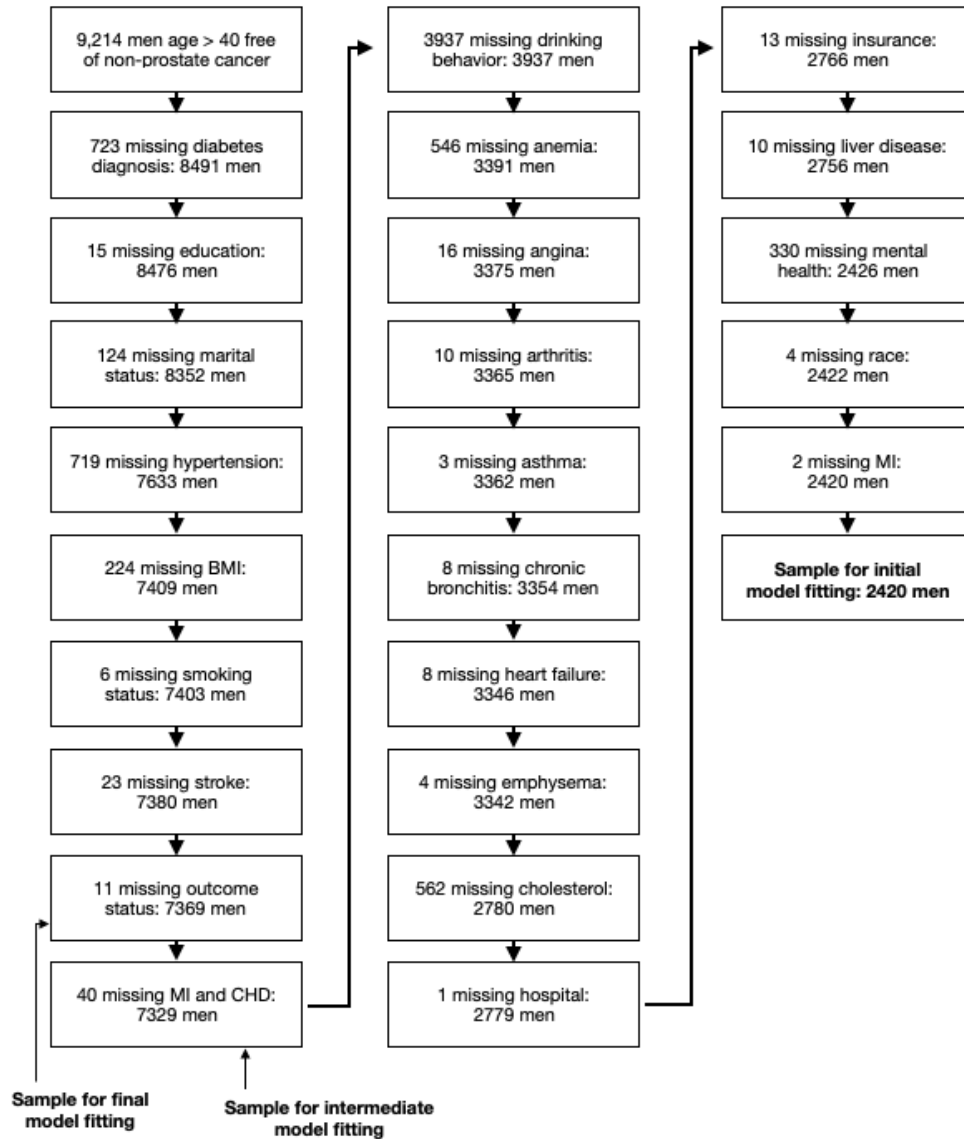

9,214 men age > 40 free of non-prostate cancer

723 missing diabetes diagnosis: 8491 men

15 missing education: 8476 men

124 missing marital status: 8352 men

719 missing hypertension: 7633 men

224 missing BMI: 7409 men

6 missing smoking status: 7403 men

23 missing stroke: 7380 men

11 missing outcome status: 7369 men

40 missing MI and CHD: 7329 men

3937 missing drinking behavior: 3937 men

546 missing anemia: 3391 men

16 missing angina: 3375 men

10 missing arthritis: 3365 men

3 missing asthma: 3362 men

8 missing chronic bronchitis: 3354 men

8 missing heart failure: 3346 men

4 missing emphysema: 3342 men

562 missing cholesterol: 2780 men

1 missing hospital: 2779 men

13 missing insurance: 2766 men

10 missing liver disease: 2756 men

330 missing mental health: 2426 men

4 missing race: 2422 men

2 missing MI: 2420 men

Sample for initial model fitting: 2420 men

Sample for final model fitting

Sample for intermediate model fitting

Figure 2: PLCO sample exclusions:

8,776 men with prostate cancer	7 missing chronic bronchitis: 8285 men
292 missing diabetes diagnosis: 8484 men	4 missing emphysema: 8281 men
14 missing education: 8470 men	13 missing liver disease: 8268 men
4 missing marital status: 8466 men	3 missing race: 8265 men
10 missing hypertension: 8456 men	45 missing treatment: 8220 men
135 missing BMI: 8321 men	**Sample for validation: 8220 men**
1 missing smoking status: 8320 men	
6 missing stroke: 8314 men	
12 missing MI and CHD: 8302 men	
10 missing arthritis: 8292 men	

Table 1: Baseline characteristics of training and validation data:

	NHANES	PLCO	p	test
n	2420	8220		
Age (years) (mean (SD))	59.4 (12.1)	69.5 (5.9)	<0.001	
Race (%)			<0.001	
NHB	411 (17.0)	475 (5.8)		
NHW	1362 (56.3)	7312 (89.0)		
Other	647 (26.7)	433 (5.3)		
Education (%)			<0.001	
Less than 9th grade	305 (12.6)	90 (1.1)		
9th-11th grade	295 (12.2)	520 (6.3)		
HS graduate	591 (24.4)	1512 (18.4)		
Some college	607 (25.1)	2605 (31.7)		
College graduate	622 (25.7)	3493 (42.5)		
Marital status (%)			<0.001	
Married	1813 (74.9)	7055 (85.8)		
Separated	466 (19.3)	945 (11.5)		
Single	141 (5.8)	220 (2.7)		
Smoking status (%)			<0.001	
Never	905 (37.4)	3368 (41.0)		
Current	538 (22.2)	736 (9.0)		
Former	977 (40.4)	4116 (50.1)		
Arthritis = Yes (%)	813 (33.6)	2471 (30.1)	0.001	
Chronic bronchitis = Yes (%)	111 (4.6)	240 (2.9)	<0.001	
Diabetes = Yes (%)	453 (18.7)	527 (6.4)	<0.001	
Emphysema = Yes (%)	75 (3.1)	183 (2.2)	0.017	
Hypertension = Yes (%)	1169 (48.3)	2742 (33.4)	<0.001	
Previous heart attack, coronary heart disease = Yes (%)	281 (11.6)	979 (11.9)	0.716	
Liver disease = Yes (%)	113 (4.7)	314 (3.8)	0.070	
Previous stroke = Yes (%)	95 (3.9)	181 (2.2)	<0.001	
BMI category (%)			<0.001	
Underweight (BMI < 18.5)	21 (0.9)	21 (0.3)		
Normal weight (BMI 18.5-25)	506 (20.9)	2326 (28.3)		
Overweight (BMI 25-40)	1801 (74.4)	5809 (70.7)		
Obese (BMI 40+)	92 (3.8)	64 (0.8)		
Prostate cancer = Yes (%)	127 (5.2)	8220 (100.0)	<0.001	
Outcome = Deceased (%)	459 (19.0)	2415 (29.4)	<0.001	
Follow-up (months) (mean (SD))	103.7 (39.0)	127.8 (57.3)	<0.001	

Table 2: Model performance:

	C-Index			AUC		
Model	5 Years	10 Years	14 Years	5 Years	10 Years	14 Years
Cox Ages 55+	0.68	0.70	0.69	0.70	0.75	0.77
Cox Ages 40+	0.69	0.70	0.70	0.70	0.75	0.78
Random Forest	0.67	0.69	0.68	0.69	0.73	0.73

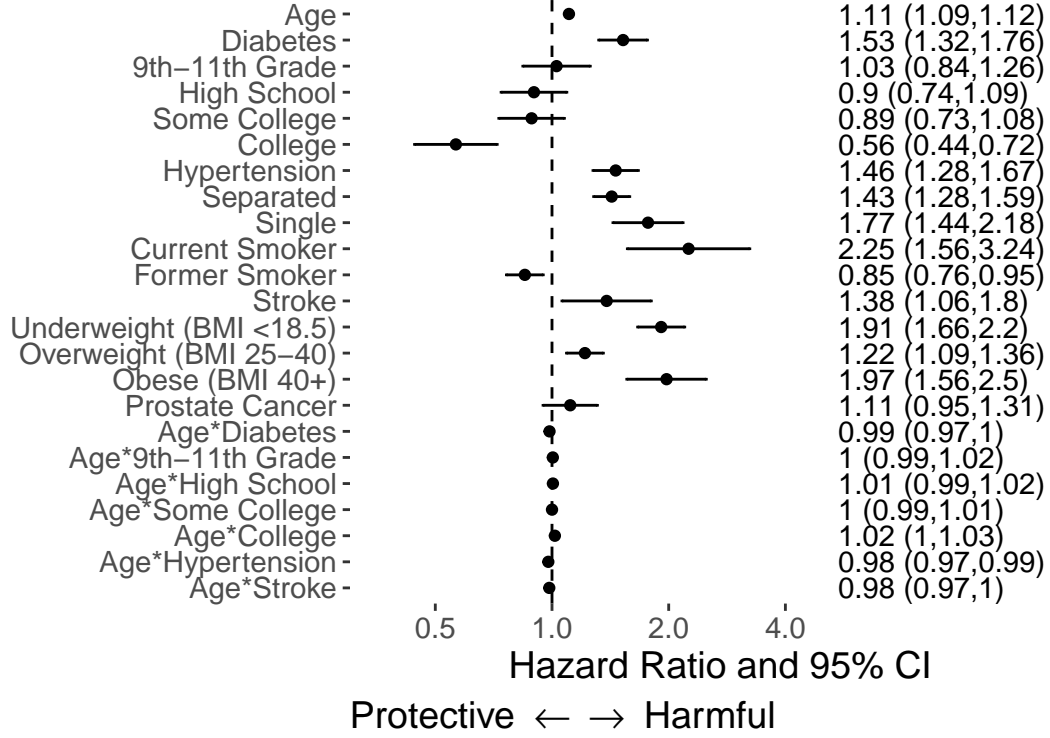Figure 3: Forest plot of final Cox model:

Age	1.11 (1.09,1.12)
Diabetes	1.53 (1.32,1.76)
9th–11th Grade	1.03 (0.84,1.26)
High School	0.9 (0.74,1.09)
Some College	0.89 (0.73,1.08)
College	0.56 (0.44,0.72)
Hypertension	1.46 (1.28,1.67)
Separated	1.43 (1.28,1.59)
Single	1.77 (1.44,2.18)
Current Smoker	2.25 (1.56,3.24)
Former Smoker	0.85 (0.76,0.95)
Stroke	1.38 (1.06,1.8)
Underweight (BMI <18.5)	1.91 (1.66,2.2)
Overweight (BMI 25–40)	1.22 (1.09,1.36)
Obese (BMI 40+)	1.97 (1.56,2.5)
Prostate Cancer	1.11 (0.95,1.31)
Age*Diabetes	0.99 (0.97,1)
Age*9th–11th Grade	1 (0.99,1.02)
Age*High School	1.01 (0.99,1.02)
Age*Some College	1 (0.99,1.01)
Age*College	1.02 (1,1.03)
Age*Hypertension	0.98 (0.97,0.99)
Age*Stroke	0.98 (0.97,1)

Hazard Ratio and 95% CI

Protective ← → Harmful

Table 3: Time-dependent AUC, C-index, by treatment:

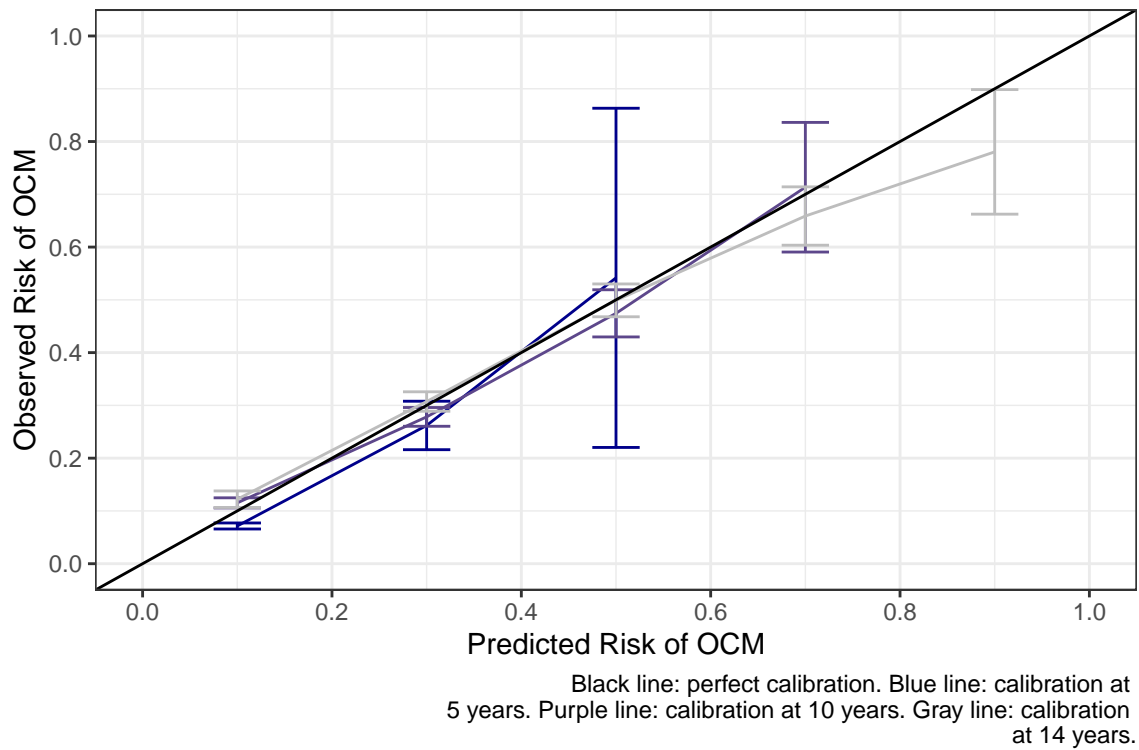|	C-Index			AUC		
Treatment	5 Years	10 Years	14 Years	5 Years	10 Years	14 Years
Prostatectomy	0.67	0.67	0.68	0.68	0.69	0.72
Radiation alone	0.64	0.66	0.66	0.65	0.71	0.74
Radiation + hormone	0.62	0.66	0.65	0.63	0.71	0.73

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Figure 4: Calibration plot, Fine and Gray:
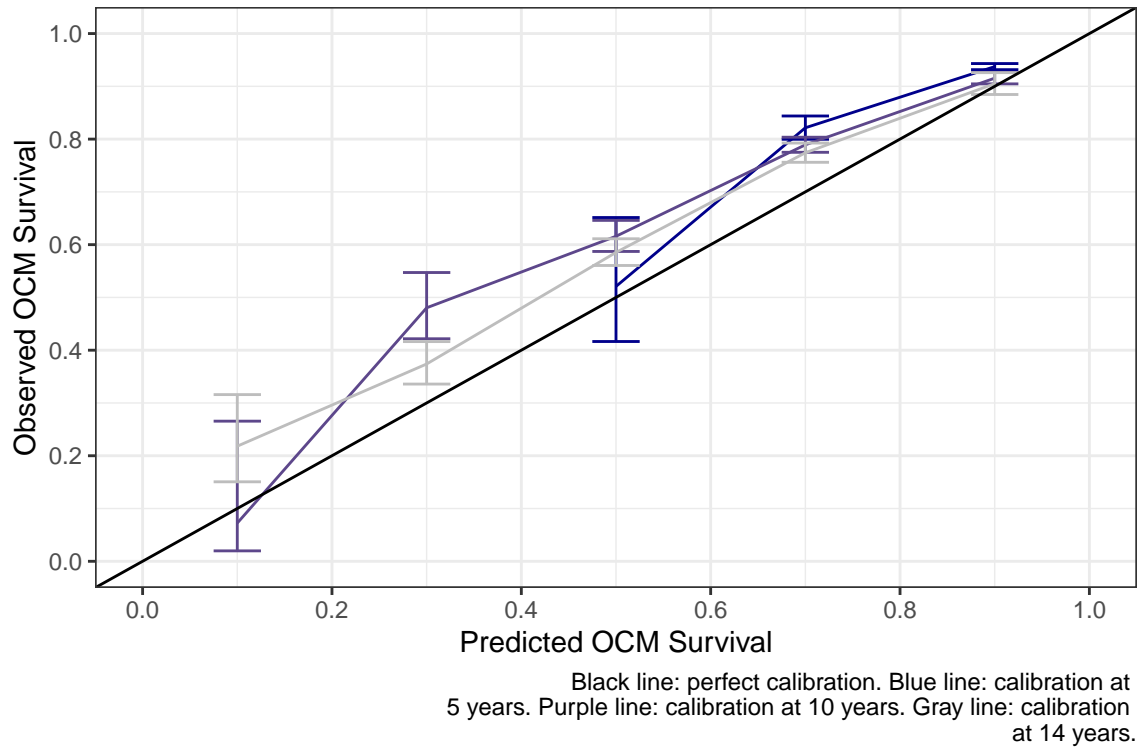

Black line: perfect calibration. Blue line: calibration at
5 years. Purple line: calibration at 10 years. Gray line: calibration
at 14 years.

Figure 5: Calibration plot, cause-specific:

Black line: perfect calibration. Blue line: calibration at
5 years. Purple line: calibration at 10 years. Gray line: calibration
at 14 years.

Figure 6: Sample incidence curves. We consider 5 different patients, with the characteristics:
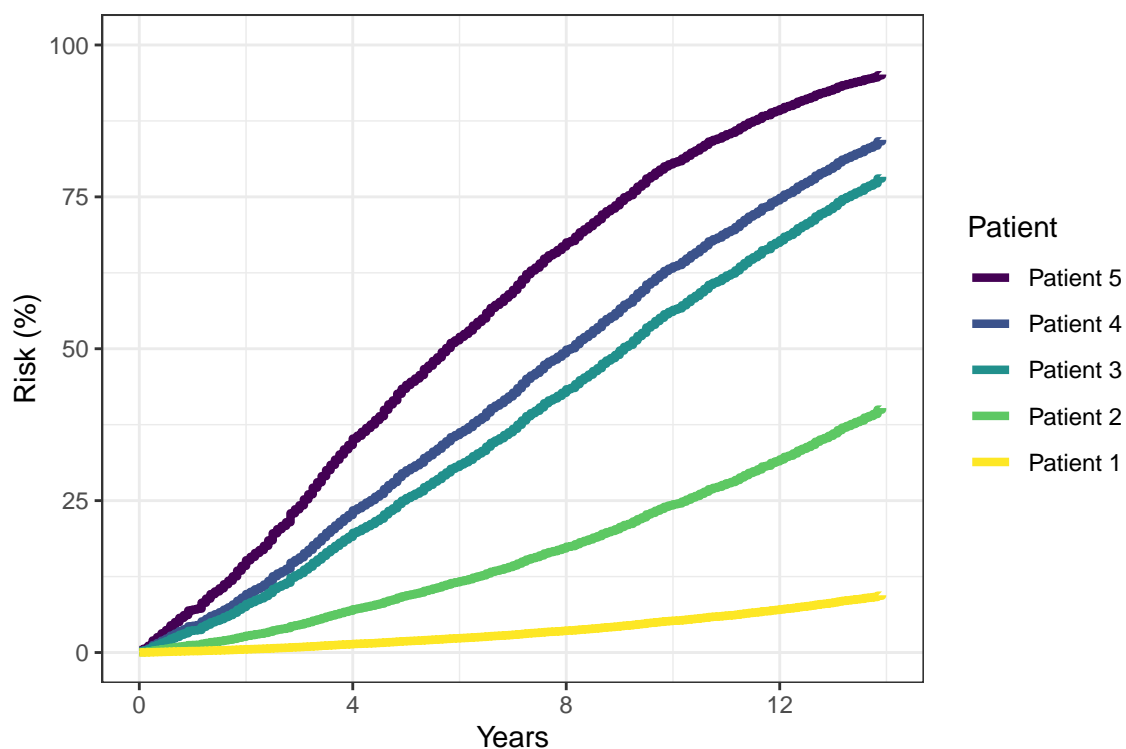
Patient 1 (lowest risk): age 58, hypertensive, college graduate, married, former smoker, BMI 25-40

Patient 2 (low risk): age 70, no comorbidities, 9th-11th grade education, married, former smoker, BMI 18.5-25

Patient 3 (moderate risk): age 80, hypertensive, high school graduate, separated, former smoker, BMI 25-40

Patient 4 (high risk): age 82, no comorbidities, 9th-11th grade education, separated, never smoker, BMI 25-40

Patient 5 (highest risk): age 80, no comorbidities, high school graduate, married, former smoker, BMI < 18.5

Figure 7: Treatment concordance with OCM predictions:
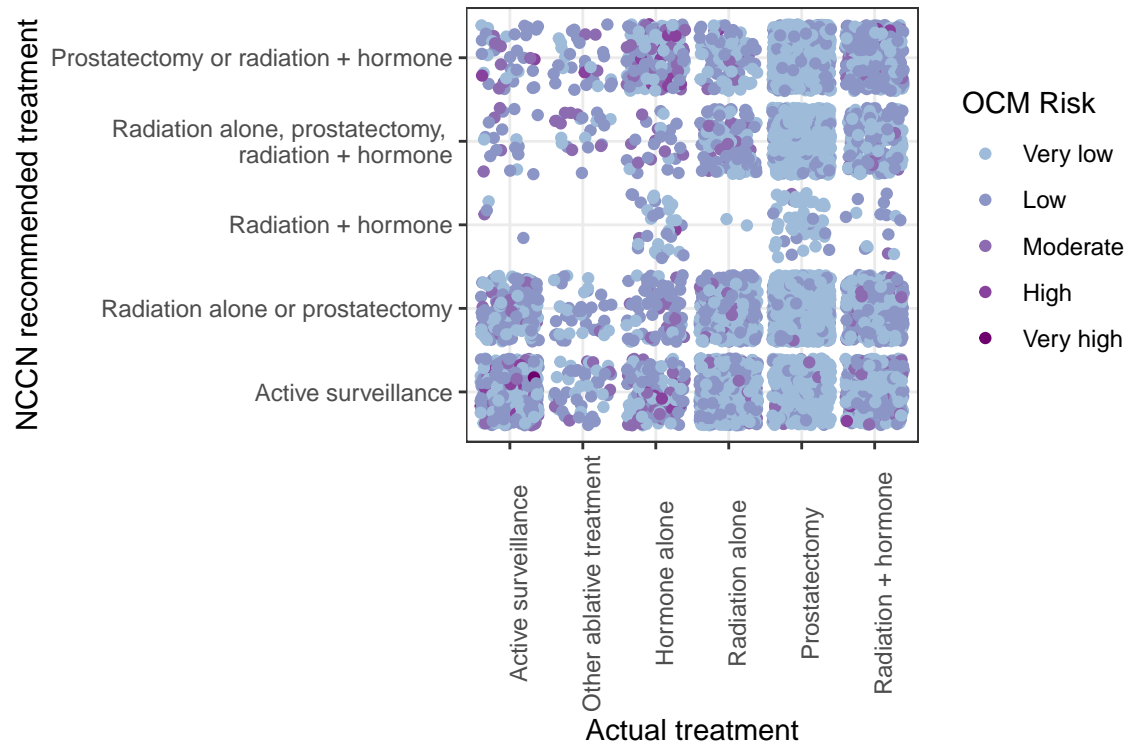
Figure 8: Distribution of treatment across PC and OC risk:
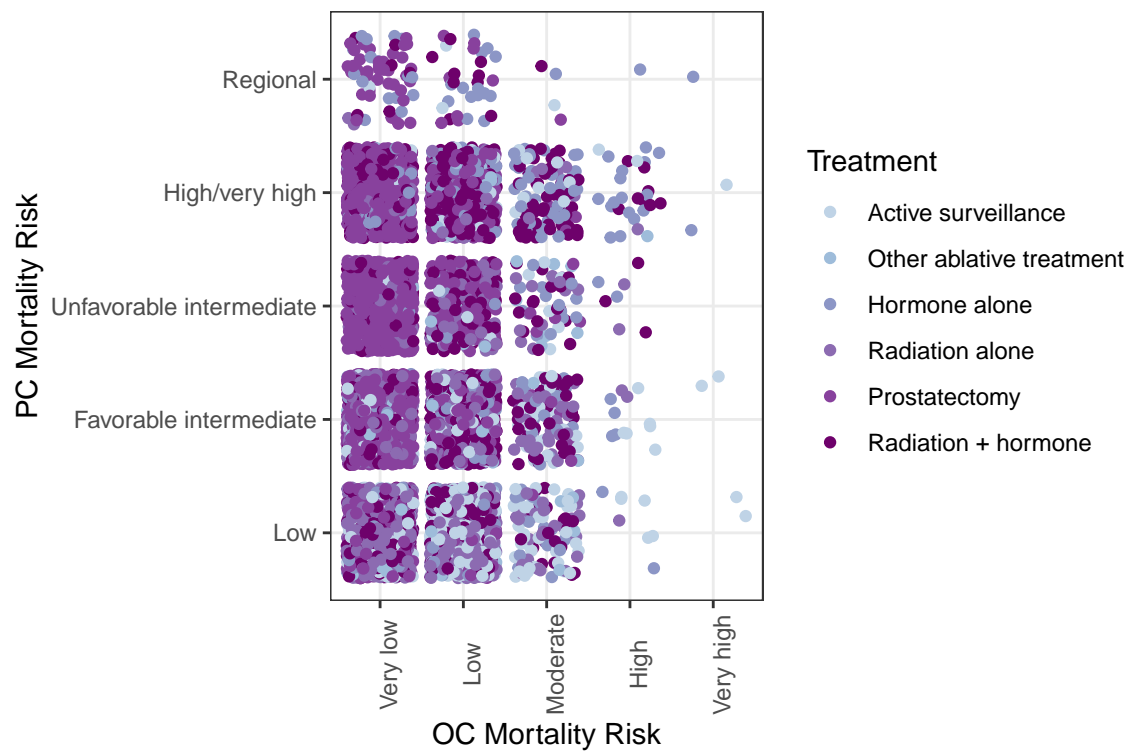
Table 4: Descriptions of life expectancy (grouped by risk of OCM at 10 years):

	Very low	Low	Moderate	High	Very high	p	test
n	4336	2644	536	72	8		
Age (years) (mean (SD))	65.9 (4.2)	73.2 (3.7)	78.0 (4.0)	80.8 (3.8)	82.4 (3.7)	<0.001	
Race (%)						<0.001	
NHB	214 (4.9)	166 (6.3)	48 (9.0)	11 (15.3)	1 (12.5)		
NHW	3927 (90.6)	2321 (87.8)	444 (82.8)	52 (72.2)	7 (87.5)		
Other	195 (4.5)	157 (5.9)	44 (8.2)	9 (12.5)	0 (0.0)		
Education (%)						<0.001	
9th-11th grade	138 (3.2)	244 (9.2)	82 (15.3)	17 (23.6)	2 (25.0)		
College graduate	2259 (52.1)	825 (31.2)	136 (25.4)	19 (26.4)	0 (0.0)		
HS graduate	654 (15.1)	580 (21.9)	136 (25.4)	20 (27.8)	2 (25.0)		
Less than 9th grade	28 (0.6)	41 (1.6)	10 (1.9)	4 (5.6)	2 (25.0)		
Some college	1257 (29.0)	954 (36.1)	172 (32.1)	12 (16.7)	2 (25.0)		
Marital status (%)						<0.001	
Married	3922 (90.5)	2191 (82.9)	364 (67.9)	31 (43.1)	2 (25.0)		
Separated	342 (7.9)	367 (13.9)	130 (24.3)	31 (43.1)	4 (50.0)		
Single	72 (1.7)	86 (3.3)	42 (7.8)	10 (13.9)	2 (25.0)		
Smoking status (%)						<0.001	
Current	256 (5.9)	284 (10.7)	111 (20.7)	24 (33.3)	4 (50.0)		
Former	1981 (45.7)	1506 (57.0)	298 (55.6)	34 (47.2)	4 (50.0)		
Never	2099 (48.4)	854 (32.3)	127 (23.7)	14 (19.4)	0 (0.0)		
Diabetes = Yes (%)	163 (3.8)	237 (9.0)	69 (12.9)	8 (11.1)	0 (0.0)	<0.001	
Hypertension = Yes (%)	1187 (27.4)	1103 (41.7)	222 (41.4)	26 (36.1)	2 (25.0)	<0.001	
Previous stroke = Yes (%)	17 (0.4)	94 (3.6)	46 (8.6)	14 (19.4)	1 (12.5)	<0.001	
BMI category (%)						<0.001	
Underweight (BMI < 18.5)	5 (0.1)	10 (0.4)	1 (0.2)	2 (2.8)	2 (25.0)		
Normal weight (BMI 18.5-25)	1073 (24.7)	801 (30.3)	230 (42.9)	41 (56.9)	2 (25.0)		
Overweight (BMI 25-40)	3236 (74.6)	1812 (68.5)	290 (54.1)	27 (37.5)	4 (50.0)		
Obese (BMI 40+)	22 (0.5)	21 (0.8)	15 (2.8)	2 (2.8)	0 (0.0)		
N Stage (%)						<0.001	
N0	3832 (88.4)	2246 (84.9)	438 (81.7)	56 (77.8)	6 (75.0)		
N1	56 (1.3)	33 (1.2)	4 (0.7)	1 (1.4)	1 (12.5)		
N2	9 (0.2)	2 (0.1)	0 (0.0)	0 (0.0)	0 (0.0)		
NX	439 (10.1)	363 (13.7)	94 (17.5)	15 (20.8)	1 (12.5)		

Table 4 cont.: Descriptions of life expectancy (grouped by risk of OCM at 10 years):

	Very low	Low	Moderate	High	Very high	p	test
n	4336	2644	536	72	8		
T Stage (%)						<0.001	
T0	1 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)		
T1-T2a	2129 (49.1)	1836 (69.4)	399 (74.4)	49 (68.1)	7 (87.5)		
T2b-T2c	1652 (38.1)	610 (23.1)	111 (20.7)	20 (27.8)	1 (12.5)		
T3a-T4	551 (12.7)	198 (7.5)	25 (4.7)	3 (4.2)	0 (0.0)		
TX	3 (0.1)	0 (0.0)	1 (0.2)	0 (0.0)	0 (0.0)		
Gleason (%)						<0.001	
<= 6	2536 (58.5)	1368 (51.7)	237 (44.2)	24 (33.3)	3 (37.5)		
7	1379 (31.8)	896 (33.9)	188 (35.1)	22 (30.6)	2 (25.0)		
8	235 (5.4)	227 (8.6)	64 (11.9)	8 (11.1)	2 (25.0)		
9	167 (3.9)	138 (5.2)	41 (7.6)	11 (15.3)	0 (0.0)		
10	19 (0.4)	15 (0.6)	6 (1.1)	7 (9.7)	1 (12.5)		
PSA at diagnosis (mean (SD))	10.5 (80.2)	13.2 (49.1)	19.0 (77.5)	39.8 (106.7)	7.2 (2.4)	<0.001	
Prostate cancer risk group (%)						<0.001	
Low	1158 (26.7)	758 (28.7)	118 (22.0)	8 (11.1)	2 (25.0)		
Favorable intermediate	1149 (26.5)	645 (24.4)	136 (25.4)	12 (16.7)	2 (25.0)		
Unfavorable intermediate	734 (16.9)	316 (12.0)	61 (11.4)	7 (9.7)	0 (0.0)		
High/very high	790 (18.2)	527 (19.9)	123 (22.9)	29 (40.3)	2 (25.0)		
Regional	65 (1.5)	35 (1.3)	4 (0.7)	1 (1.4)	1 (12.5)		
NA	440 (10.1)	363 (13.7)	94 (17.5)	15 (20.8)	1 (12.5)		
Primary treatment (%)						<0.001	
Active surveillance	304 (7.0)	424 (16.0)	112 (20.9)	19 (26.4)	6 (75.0)		
Other ablative treatment	49 (1.1)	94 (3.6)	22 (4.1)	2 (2.8)	0 (0.0)		
Hormone alone	143 (3.3)	250 (9.5)	122 (22.8)	31 (43.1)	2 (25.0)		
Radiation alone	817 (18.8)	681 (25.8)	109 (20.3)	9 (12.5)	0 (0.0)		
Prostatectomy	2318 (53.5)	504 (19.1)	22 (4.1)	0 (0.0)	0 (0.0)		
Radiation + hormone	705 (16.3)	691 (26.1)	149 (27.8)	11 (15.3)	0 (0.0)		
Treatment concordance with NCCN recs (%)						<0.001	
Not aggressive enough	255 (5.9)	376 (14.2)	119 (22.2)	22 (30.6)	1 (12.5)		
Concordant	2497 (57.6)	1188 (44.9)	175 (32.6)	19 (26.4)	4 (50.0)		
Too aggressive	1144 (26.4)	717 (27.1)	148 (27.6)	16 (22.2)	0 (0.0)		
NA	440 (10.1)	363 (13.7)	94 (17.5)	15 (20.8)	3 (37.5)		
Outcome (%)						<0.001	
Alive	3214 (74.1)	1507 (57.0)	237 (44.2)	17 (23.6)	2 (25.0)		
Died of OC	900 (20.8)	965 (36.5)	264 (49.3)	48 (66.7)	4 (50.0)		
Died of PC	222 (5.1)	172 (6.5)	35 (6.5)	7 (9.7)	2 (25.0)		