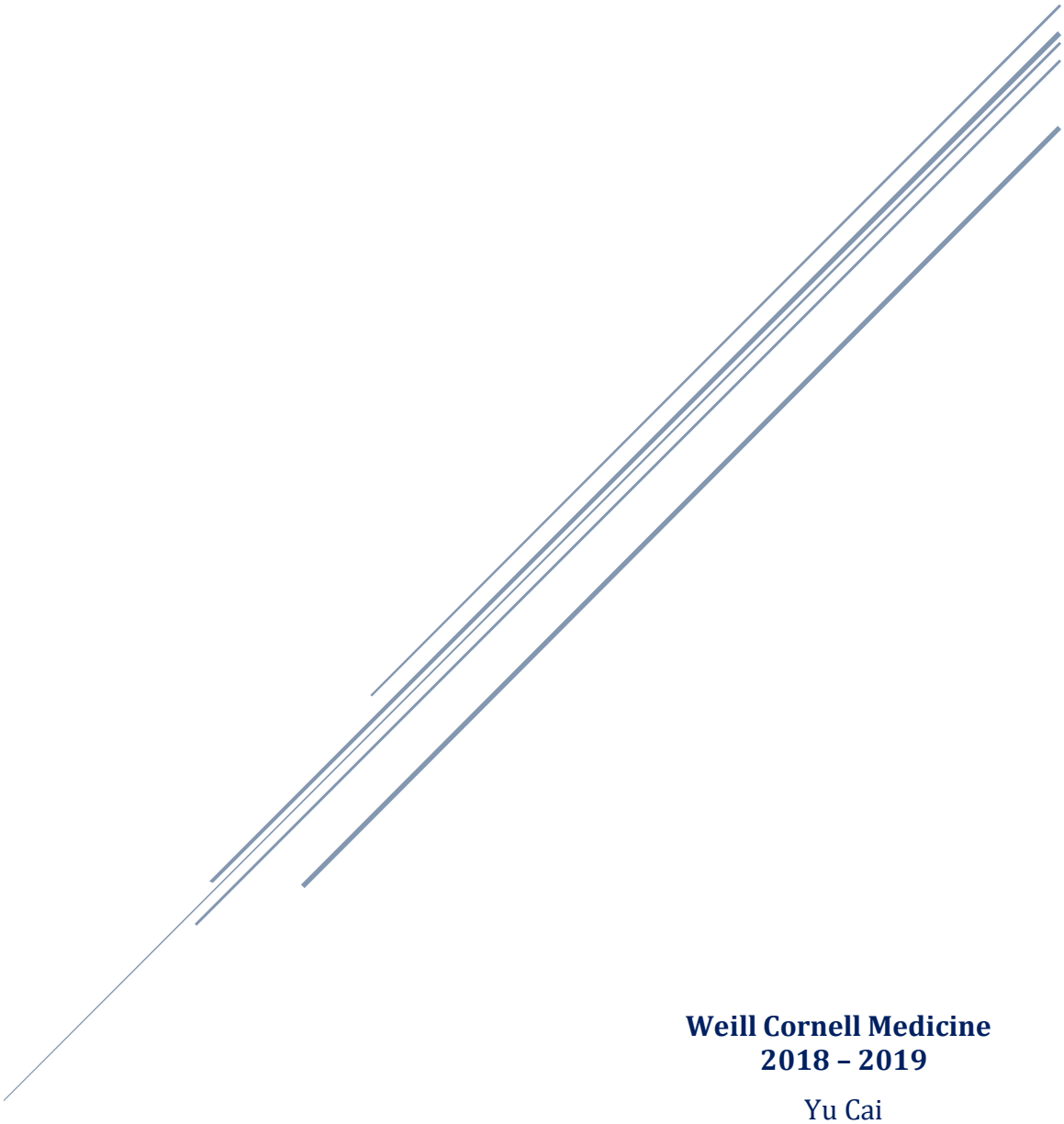
Racial and Regional Differences in Active Surveillance for Low-Risk Prostate Cancer in the United States

A Retrospective Cohort Study, 2010-2015



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Introduction

Prostate cancer is one of the most common types of cancer in the United States. Cancer is a disease in which cells in the body grow out of control. When cancer starts in the prostate, it is called prostate cancer. Except for skin cancer, prostate cancer is the most common cancer in American men. According to National Cancer Institution, there will be approximately 175,000 new prostate cancer cases in 2019, which is approximately 9.9% of all new cancer cases. Prostate cancer is also second leading cause of cancer death among men in the United States. According to the National Cancer Institution, there will be approximately 31,620 new prostate cancer cases in 2019, which is approximately 5.2% of all new cancer cases[7]. Although prostate cancer has a high mortality rate, low-risk prostate cancer barely metastasis or show any symptoms. Many patients with prostate cancer died of other causes without ever having any symptoms from the cancer[12]. Therefore, performing invasive treatments like surgery and radiation therapy might not extend patient life quality or living time. A popular alternative option is to use the active surveillance. Active surveillance is a treatment plan that involves closely watching a patient's condition but not giving any treatment unless there are changes in test results that show the condition is getting worse[5].

Recently, Surveillance, Epidemiology, and End Results (SEER) released the *Prostate with Watchful Waiting Data* from 2010-2015. This is the first time that a national database took active surveillance (i.e. watchful waiting) into documentation. Before this publication of data, researchers had to either combine *SEER* data with Medicare data or use data collected from hospitals or foundations. Compared with previous studies, data used in this research is more general and comprehensive.

By exploring the usage of active surveillance in different racial groups and regional groups in 2010 to 2015, researchers found that the usage of active surveillance were increasing at different speeds among different racial groups and different regions.

In a newly published letter, Butler, S. et al stated that African-American males were less likely to receive active surveillance than males in all other racial groups by 2015[1]. However, this letter did not take the effects of regional difference into consideration. Researchers would like to do explorations on the models that considered regional differences as a key factor. Therefore, this research aimed to find out the effect of racial and regional differences in the usage of active surveillance for low-risk prostate cancer in the United States.

Data Preparation

The research data was extracted from *Prostate with Watchful Waiting Data* from 2010-2015 in *SEER* database. All variables were selected based on previous studies on active surveillance. Main principle of data extraction was to choose patients with low-risk prostate cancer. Inclusion and exclusion criteria were based on the definition of low-risk prostate cancer in the National Cancer Database[12]. Also, patients with the symptoms of high-risk prostate cancer, such as metastasis or having lymph nodes, were removed from the data. The details of inclusion and exclusion criteria are listed in appendix (Table 0.2).

Since we were interested in the usage of active surveillance in Black and non-Black patients in different regions, this research had response variables releveled. The response variable was classified into active surveillance, invasive care and unknown. Race was the primary interested variable which was releveled into Black and non-Black groups. Region (i.e. mid-west, northeast, south, west) was releveled from the states in the United States based on the location in the nation.

Statistical Analysis

Descriptive statistics were prepared to characterize the study population and examine the univariate differences between (1) the treatment group of receiving active surveillance and invasive cares; (2) race group of Black and non-Black. Median household income, the percentage of families under the poverty line and the percentage of people under high school education were categorized into quantile according to the nationwide distribution of the corresponding variable. The PSA lab value was evaluated by median and quantile according to its non-parametric distribution.

Unadjusted odds ratios for treatment (active surveillance vs. invasive care) corresponding to the assigned variables were estimated by using unconditional logistic regression. Variables considered as confounder was region. Final models were adjusted for age; PSA value; Gleason score; year of diagnosis; insured status; median household income in tens of dollars; percentage of families under the poverty line; percentage of people under high school education; number of examined cores and positive cores. In order to identify the regional differences on people receiving active surveillance, models stratified by regions (i.e. west, mid-west, northeast, south) were adjusted based on the same variables mentioned above. Sensitivity analysis were conducted to evaluate the effect of unknown data in the response (i.e. treatment status).

Result

There were more patients received invasive care (N = 96,054, 81.3%) than active surveillance (N = 22,035, 18.7%) in our analyzed dataset. The percentage of Black patients received less active surveillance treatment (N = 3,044, 16.3%) than the that of non-Black patients (N = 18,991, 19.1%). The proportion of patients received active surveillance were similar in the mid-west, northeast and south regions (15%). The proportion of patients received active surveillance in the west was about 23%. The mean age of patients received active surveillance was 65 (in years) while that of the invasive care was 63 (in years). The median of PSA lab value of active surveillance group was 5.8 with 0.25 quantile of 4.6 and 0.75 quantile of 8.2 while the median in invasive care group was either 5.8 with 0.25 quantile of 4.5 and 0.75 quantile of 7.8. Approximately 88% of the patients who received active surveillance had a Gleason score of 3+3 (N = 19,338) while 53% of patients who received invasive care were 3+3 (N = 50938). The number of patients who received active surveillance kept increasing from 2010 (N = 2,776, 12.6%) to 2013 (N = 4,373, 19.8%) and increased from 2014 (N = 3,817, 17.3%) to 2015 (N = 4,053, 18.4%). In the meanwhile, the number of patients received invasive care kept decreasing from 2010 (N = 21,199, 22.1%) to 2015 (N = 12,009, 12.5%).

The multivariate logistic regression of treatment (active surveillance vs. invasive care) adjusted for age, region, PSA, Gleason score, year of diagnosis, insured status, median household income in tens of dollars, percentage of families under the poverty line, percentage of people under high school education, number of examined cores and positive cores were statistically significantly related to the response variable (i.e. treatment status) at a 0.05 significance level (Table 2.1.1). The unadjusted odds ratios for each variable were provided for comparisons. The unadjusted odds ratio of race (Black vs. non-Black) was 0.83 with a 95% confidence interval of from 0.79 to 0.86 which indicated that Black patients had 17% lower odds of receiving active surveillance than non-Black patients. However, the odds ratio of race (Black vs. non-Black) become 1.21 with a 95 % confidence interval from 1.15 to 1.27 after adjustment. It indicated that Black patients had 21% more odds of receiving active surveillance than non-Black patients.

The odds ratio of race (Black vs. non-Black) changed from 0.83 to 1.21 implies there must exist some crucial factors that might affect whether Black patients received active surveillance or not. Stratified by regions (i.e. mid-west, northeast, south, west), Black patients were less likely to receive active surveillance in the northeast area (OR: 0.80, 95% CI: 0.70 - 0.92), but they were more likely to receive active surveillance in the mid-west (OR: 1.26, 95CI: 1.09 - 1.47) and west regions (OR: 1.41, 95% CI: 1.31 - 1.53) after adjusted for socioeconomic and demographic factors. We were not able to give any conclusion for south region since the odds ratio (OR: 1.08, 95% CI: 0.99 - 1.18) was not statistically significant at a 0.05 level. (Table 3.1)

Conclusion

Whether patients receive invasive care or active surveillance for prostate cancer were significantly between Blacks and non-Blacks. Nationally speaking, Black patients were more likely to receive active surveillance than non-Black patients, which is very different from the conclusion that Butler, S. et al stated in the *New England Journal of Medicine*. Moreover, we found that whether Black patients received active surveillance or not were various among different regions. Region was one of the most influential factors that affected whether Black patients received active surveillance or not (Table 2.1.1). It is shown that Black patients are more likely to receive active surveillance in the mid-west and west regions, but they are less likely to receive active surveillance in the northeast region.

Discussion

There existed a significant amount (N = 20,469, 14.88%) of unknown data in the outcome variable (i.e. treatment status). The sensitivity analysis was conducted to evaluate the actual effect of those unknown on the analysis results. We firstly assumed that people with unknown treatment were all receiving active surveillance. The adjusted odds ratio of Black patients receiving active surveillance versus non-Black patients was 1.33 with a 95% confidence interval from 1.28 to 1.38 (Table 2.3). The stratified models based on different regions showed that the adjusted odds ratios of mid-west, south and west were significantly greater than 1 (Table 3.2), indicating that the results were consistent nationwide. Assuming that people with unknown treatment were all receiving invasive care, the adjusted odds

ratio of Black patients receiving active surveillance as opposed to non-Black patients turned to 1.16 with a 95% confidence interval from 1.11 to 1.22 (Table 2.4). The corresponding stratified models based on different regions showed that the adjusted odds ratios of mid-west and west were significantly greater than 1 while that of northeast was less than 1 (Table 3.3), leaving that the odds ratio of south region insignificant. It means Blacks patients were more likely to receive active surveillance rather than non-Black patients in the mid-west and west areas but the situation in northeast was to the opposite. There existed a significant difference between assuming patients with unknown treatments received active surveillance and invasive care. Therefore, we tended to do analysis regardless of all unknown data in the outcome variable in order to keep the accuracy of the analysis results. However, there might be some difference in the further analysis if SEER improved their database with more valid data or multiple imputation for outcome variable might be applied to increase the number of valid data.

The conclusion that Black patients are less likely to receive active surveillance that Butler, S. et.al stated in *New England Journal of Medicine* was superficial. The adjusted odds ratio of Black patients receiving active surveillance as opposed to non-Black patients was 0.93 with a 95% confidence interval from 0.88 to 0.99 where the confidence interval that indicated the significance of 0.93 was extremely weak. Additionally, the majority of the study was not nationally representative since socioeconomic factors as well as insured status were not adjusted. Moreover, 0.93 was the odds ratio for Black versus non-Black in 2015 and the analysis outcome from 2010 to 2014 are not consistent with the conclusion in 2015. Therefore, we improved the analysis by including data from 2010 to 2015 and adjusted by all potential demographic and socioeconomic factors.

There still existed some limitations in our study. Since the size of the analyzed sample is comparatively large (N = 138,746), the inference based on the p-values may not be reliable. It is more appropriate to make conclusions according to the odds ratios and their confidence intervals. However, an odds ratio of 1.21 is still comparatively weak even if the 95% confidence interval is statistically significant. Possible reasons might include undetected confounders and missing data. At this point, we are not able to deal with the unknown categories unless *SEER* improve the database with more eligible data. More studies are necessary to validate our results.

References

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Appendix

Table 0.1 Dataset

Source	Prostate with Watchful Waiting Data © *Surveillance, Epidemiology and End Results (SEER)*	
Category	**Detail**	**Description**
Response variable	Treatment status	Invasive Care, Active Surveillance, Unknown
Primary interested variables	Race	Black, Non-Black
	Region	West, South, Midwest, Northeast
Exploratory variables	Age	(in years)
	PSA lab value	(ng/mL)
	Gleason score	Summation of two test scores (1 – 5 for each)
	Year of diagnosis	2010 to 2015
	Insured status	Any Medicaid, Insured, Uninsured, Unknown
	Median household income	Regional median household income (in tens of dollars)
	Family poverty	Regional percentage of family under poverty line
	High-school education	Regional percentage of people below high-school education
	Number of examined cores	
	Number of positive cores	

Table 0.2 Data Cleaning Criteria

	Criteria	Description
Race	Exclude unknown	
PSA	Exclude unknown	
Age	≥ 40	Most prostate cancer occur in men older than 40 years old
Gleason Score	3 + 3 and 3 + 4	3 + 3 and 3 + 4 means the cancer does exist but not serious
Clinical Stage	T1a, T1b, T1c, T2a	Stage T2a or lower means small tumor size
Metastasis	No metastasis	The cancer has not spread
Lymph Node	No lymph node	Lymph node staging determines whether the cancer is present in nearby lymph nodes. The cancer has not spread to lymph nodes in the immediate area.
Examined Cores	Exclude unknown	
Positive Cores	Exclude unknown	

Table 0.3 Classifications

	Classification	Original Categories
Race	Black	Non-Hispanic Black
	Non-Black	Hispanic (All Races), Non-Hispanic American Indian/Alaska Native, Non-Hispanic Asian or Pacific Islander, Non-Hispanic White
Region	West	Alaska, California, Hawaii, New Mexico, Utah, Washington
	Northeast	Connecticut, New Jersey
	South	Georgia, Kentucky, Louisiana
	Midwest	Iowa, Michigan

Table 1.1 Characteristics of patients in treatment status (invasive care, active surveillance, unknown)

Variables	Treatment			P-values
	Invasive Care (N = 96,054)	**Active Surveillance** (N = 22,035)	**Unknown** (N = 20,641)	
Race, N (%)				< 0.001
Black	15599 (68.9)	3044 (13.4)	4003 (17.7)	
Non-Black	80455 (69.3)	18991 (16.4)	16638 (14.3)	
Region, N (%)				< 0.001
Midwest	10452 (72.8)	1947 (13.6)	1965 (13.7)	
Northeast	17530 (73.7)	3216 (13.5)	3030 (12.7)	
South	23923 (71.5)	3818 (11.4)	5736 (17.1)	
West	44149 (65.8)	13054 (19.5)	9910 (14.8)	
Age (years)				< 0.001
mean $\pm$ SD	63.1 (7.8)	65.1 (8.0)	66.3 (8.9)	
PSA (ng/mL)				
median (Q1, Q3)	5.8 (4.6, 8.2)	5.8 (4.5, 7.8)	6.3 (4.7, 9.4)	
Gleason Score, N (%)				< 0.001
3 + 3	50938 (53.0)	19338 (87.8)	14395 (69.7)	
3 + 4	45116 (47.0)	2697 (12.2)	6246 (30.3)	
Year of diagnosis, N (%)				< 0.001
2010	21197 (22.1)	2776 (12.6)	3938 (19.1)	
2011	20953 (21.8)	3474 (15.8)	3986 (19.3)	
2012	15975 (16.6)	3542 (16.1)	3375 (16.4)	
2013	13870 (14.4)	4373 (19.8)	3345 (16.2)	
2014	12050 (12.5)	3817 (17.3)	2894 (14.0)	
2015	12009 (12.5)	4053 (18.4)	3103 (15.0)	
Insured status, N (%)				< 0.001
Any Medicaid	3840 (4.0)	648 (2.9)	1030 (5.0)	
Insured	86065 (89.6)	19648 (89.2)	14385 (69.7)	
Uninsured	1126 (1.2)	257 (1.2)	449 (2.2)	
Unknown	5023 (5.2)	1482 (6.7)	4777 (23.1)	
Median Household Income quantiles - in tens of dollars, N (%)				< 0.001
Poor [1897, 5065)	24541 (25.5)	4185 (19.0)	6269 (30.4)	
Fair [5065, 5797)	22386 (23.3)	4872 (22.1)	4844 (23.5)	
Above average [5797, 7259)	25167 (26.2)	5916 (26.8)	4761 (23.1)	
Wealthy [7259, 10818]	23960 (24.9)	7062 (32.0)	4767 (23.1)	
Family Poverty quantiles - percentage of family under poverty line, N (%)				< 0.001
Poor [14.21, 41.75]	24544 (25.6)	6736 (30.6)	4461 (21.6)	
Fair [10.29, 14.21)	23878 (24.9)	6034 (27.4)	4804 (23.3)	
Above average [7.5, 10.29)	23166 (24.1)	5241 (23.8)	5092 (24.7)	
Wealthy [1.74, 7.5)	24466 (25.5)	4024 (18.3)	6284 (30.4)	
Education quantiles - percentage under high school education, N (%)				< 0.001
Poorly educated [18.28, 38.97]	25073 (26.1)	5619 (25.5)	4521 (21.9)	
Fairly educated [13.02, 18.28)	24121 (25.1)	6565 (29.8)	4953 (24.0)	
Well educated [9.82, 13.02)	24253 (25.2)	5236 (23.8)	5685 (27.5)	
Highly educated [1.59, 9.82)	22607 (23.5)	4615 (20.9)	5482 (26.6)	
Number of Examined Cores, N (%)				< 0.001
< 12	12271 (12.8)	2296 (10.4)	3284 (15.9)	
= 12	35854 (37.3)	9154 (41.5)	6908 (33.5)	
> 12	16096 (16.8)	4730 (21.5)	3568 (17.3)	
Unknown	31833 (33.1)	5855 (26.6)	6881 (33.3)	
Number of Positive Cores, N (%)				< 0.001
≤ 2	29360 (30.6)	13756 (62.4)	9347 (45.3)	
≥ 3	44053 (45.9)	4919 (22.3)	6576 (31.9)	
Unknown	22641 (23.6)	3360 (15.2)	4718 (22.9)	

Note: Percentage of race and region are calculated by row

Table 1.2.1 Characteristics of patients in Black and non-Black groups regardless of unknown treatment status

Variables	Race		P-value
	Black (N = 18,643)	**Non-Black** (N = 99,446)	
Treatment, N (%)			< 0.001
Invasive Care	15599 (83.7)	80455 (80.9)	
Active Surveillance	3044 (16.3)	18991 (19.1)	
Region, N (%)			< 0.001
Midwest	2358 (12.6)	10041 (10.1)	
Northeast	2892 (15.5)	17854 (18.0)	
South	8231 (44.2)	19510 (19.6)	
West	5162 (27.7)	52041 (52.3)	
Age (years)			< 0.001
mean $\pm$ SD	61.4 ± 8.0	63.9 ± 7.8	
PSA (ng/mL)			
median (Q1, Q3)	6.1 (4.7, 8.9)	5.8 (4.5, 8.0)	
Gleason Score, N (%)			< 0.001
3 + 3	10425 (55.9)	59851 (60.2)	
3 + 4	8218 (44.1)	39595 (39.8)	
Year of diagnosis, N (%)			< 0.001
2010	3604 (19.3)	20369 (20.5)	
2011	3657 (19.6)	20770 (20.9)	
2012	3105 (16.7)	16412 (16.5)	
2013	2984 (16.0)	15259 (15.3)	
2014	2620 (14.1)	13247 (13.3)	
2015	2673 (14.3)	13389 (13.5)	
Insured status, N (%)			< 0.001
Any Medicaid	1357 (7.3)	3131 (3.1)	
Insured	1250 (6.7)	5255 (5.3)	
Uninsured	15602 (83.7)	90111 (90.6)	
Unknown	434 (2.3)	949 (1.0)	
Median household income quantile - in tens of dollars, N (%)			< 0.001
Poor [1897, 5065)	7120 (38.2)	21606 (21.7)	
Fair [5065, 5797)	4787 (25.7)	22471 (22.6)	
Above average [5797, 7259)	3970 (21.3)	27113 (27.3)	
Wealthy [7259, 10818]	2766 (14.8)	28256 (28.4)	
Family poverty quantile – percentage of family under poverty line, N (%)			< 0.001
Poor [14.21, 41.75]	7676 (41.2)	20814 (20.9)	
Fair [10.29, 14.21)	5306 (28.5)	23101 (23.2)	
Above average [7.5, 10.29)	3247 (17.4)	26665 (26.8)	
Wealthy [1.74, 7.5)	2414 (12.9)	28866 (29.0)	
Education quantile - percentage under high school education, N (%)			< 0.001
Poorly educated [18.28, 38.97]	4262 (22.9)	22960 (23.1)	
Fairly educated [13.02, 18.28)	6507 (34.9)	22982 (23.1)	
Well educated [9.82, 13.02)	4911 (26.3)	25775 (25.9)	
Highly educated [1.59, 9.82)	2963 (15.9)	27729 (27.9)	
Number of Examined Cores, N (%)			< 0.001
< 12	2363 (12.7)	12206 (12.3)	
= 12	7401 (39.7)	37609 (37.8)	
> 12	3273 (17.6)	17554 (17.7)	
Unknown	5607 (30.1)	32084 (32.3)	
Number of Positive Cores, N (%)			< 0.001
≤ 2	6211 (33.3)	36905 (37.1)	
≥ 3	8440 (45.3)	40532 (40.8)	
Unknown	3992 (21.4)	22009 (22.1)	

Table 1.2.2 Characteristics of patients in Black and non-Black groups in UNKNOWN treatment status

Variables	Race		P-value
	Black (N = 4,003)	**Non-Black** (N = 16, 638)	
Region, N (%)			< 0.001
Midwest	454 (11.3)	1511 (9.1)	
Northeast	480 (12.0)	2550 (15.3)	
South	2016 (50.4)	3720 (22.4)	
West	1053 (26.3)	8857 (53.2)	
Age (years)			< 0.001
mean ± SD	64.1 (9.0)	66.8 (8.7)	
PSA (ng/mL)			
median (Q1, Q3)	6.9 (4.9, 11.1)	6.2 (4.7, 9.0)	
Gleason Score, N (%)			< 0.001
3 + 3	2422 (60.5)	11973 (72.0)	
3 + 4	1581 (39.5)	4665 (28.0)	
Year of diagnosis, N (%)			< 0.001
2010	698 (17.4)	3240 (19.5)	
2011	714 (17.8)	3272 (19.7)	
2012	724 (18.1)	2651 (15.9)	
2013	693 (17.3)	2652 (15.9)	
2014	566 (14.1)	2328 (14.0)	
2015	608 (15.2)	2495 (15.0)	
Insured status, N (%)			< 0.001
Any Medicaid	350 (8.7)	680 (4.09)	
Insured	2711 (67.7)	11674 (70.2)	
Uninsured	164 (4.10)	285 (1.7)	
Unknown	778 (19.4)	3999 (24.0)	
Median household income quantile - in tens of dollars, N (%)			< 0.001
Poor [1897, 5065)	1759 (43.9)	4510 (27.1)	
Fair [5065, 5797)	1060 (26.5)	3784 (22.7)	
Above average [5797, 7259)	717 (17.9)	4044 (24.3)	
Wealthy [7259, 10818]	467 (11.7)	4300 (25.8)	
Family poverty quantile - percentage of family under poverty line, N (%)			< 0.001
Poor [14.21, 41.75]	373 (9.32)	4088 (24.6)	
Fair [10.29, 14.21)	600 (15.0)	4204 (25.3)	
Above average [7.5, 10.29)	1164 (29.1)	3928 (23.6)	
Wealthy [1.74, 7.5)	1866 (46.6)	4418 (26.6)	
Education quantile - percentage under high school education, N (%)			< 0.001
Poorly educated [18.28, 38.97]	520 (13.0)	4001 (24.0)	
Fairly educated [13.02, 18.28)	932 (23.3)	4021 (24.2)	
Well educated [9.82, 13.02)	1412 (35.3)	4273 (25.7)	
Highly educated [1.59, 9.82)	1139 (28.5)	4343 (26.1)	
Number of Examined Cores, N (%)			< 0.001
< 12	702 (17.5)	2582 (15.5)	
= 12	1324 (33.1)	5584 (33.6)	
> 12	657 (16.4)	2911 (17.5)	
Unknown	1320 (33.0)	5561 (33.4)	
Number of Positive Cores, N (%)			0.014
≤ 2	1583 (39.5)	7764 (46.7)	
≥ 3	1521 (38.0)	5055 (30.4)	
Unknown	899 (22.5)	3819 (23.0)	

Table 1.3 Characteristics of patients in invasive care and active surveillance regardless of unknown treatment status

Variables	Treatment		P-value
	Invasive Care (N = 96,054)	**Active surveillance** (N = 22,035)	
Race, N (%)			< 0.001
Black	15599 (83.7)	3044 (16.3)	
Non-Black	80455 (80.9)	18991 (19.1)	
Region, N (%)			< 0.001
Midwest	10452 (84.3)	1947 (15.7)	
Northeast	17530 (84.5)	3216 (15.5)	
South	23923 (86.2)	3818 (13.8)	
West	44149 (77.2)	13054 (22.8)	
Age (years)			< 0.001
mean ± SD	63.1 (7.8)	65.1 (8.0)	
PSA (ng/mL)			
median (Q1, Q3)	5.8 (4.6, 8.2)	5.8 (4.5, 7.8)	
Gleason Score, N (%)			< 0.001
3 + 3	50938 (53.0)	19338 (87.8)	
3 + 4	45116 (47.0)	2697 (12.2)	
Year of diagnosis, N (%)			< 0.001
2010	21197 (22.1)	2776 (12.6)	
2011	20953 (21.8)	3474 (15.8)	
2012	15975 (16.6)	3542 (16.1)	
2013	13870 (14.4)	4373 (19.8)	
2014	12050 (12.5)	3817 (17.3)	
2015	12009 (12.5)	4053 (18.4)	
Insured status, N (%)			< 0.001
Any Medicaid	3840 (4.0)	648 (2.9)	
Insured	86065 (89.6)	19648 (89.2)	
Uninsured	1126 (1.2)	257 (1.2)	
Unknown	5023 (5.2)	1482 (6.7)	
Median Household Income - in tens of dollars, N (%)			< 0.001
Poor [1897, 5065)	24541 (25.5)	4186 (19.0)	
Fair [5065, 5797)	22386 (23.3)	4872 (22.1)	
Above average [5797, 7259)	25167 (26.2)	5916 (26.8)	
Wealthy [7259, 10818]	23960 (24.9)	7062 (32.0)	
Family Poverty - percentage of family under poverty line, N (%)			< 0.001
Poor [14.21, 41.75]	24466 (25.5)	4024 (18.3)	
Fair [10.29, 14.21)	23166 (24.1)	5241 (23.8)	
Above average [7.5, 10.29)	23878 (24.9)	6034 (27.4)	
Wealthy [1.74, 7.5)	24544 (25.6)	6736 (30.6)	
Education - percentage under high school education, N (%)			< 0.001
Poorly educated [18.28, 38.97]	22607 (23.5)	4615 (20.9)	
Fairly educated [13.02, 18.28)	24253 (25.2)	5236 (23.8)	
Well educated [9.82, 13.02)	24121 (25.1)	6565 (29.8)	
Highly educated [1.59, 9.82)	25073 (26.1)	5619 (25.5)	
Number of Examined Cores (%)			< 0.001
< 12	12271 (12.8)	2296 (10.4)	
= 12	35854 (37.3)	9154 (41.5)	
> 12	16096 (16.8)	4730 (21.5)	
Unknown	31833 (33.1)	5855 (26.6)	
Number of Positive Cores (%)			< 0.001
≤ 2	29360 (30.6)	13756 (62.4)	
≥ 3	44053 (45.9)	4919 (22.3)	
Unknown	22641 (23.6)	3360 (15.2)	

Note: Percentage of race and region are calculated by row

Table 1.4 Characteristics of patients in invasive care and active surveillance combining unknowns into active surveillance

Variables	Treatment		P-value
	Invasive Care (N = 96,054)	**Active Surveillance** (N = 42,676)	
Race, N (%)			0.208
Black	15599 (68.9)	7047 (31.1)	
Non-Black	80455 (69.3)	35629 (30.7)	
Region, N (%)			< 0.001
Midwest	10452 (72.8)	3912 (27.2)	
Northeast	17530 (73.7)	6246 (26.3)	
South	23923 (71.5)	9554 (28.5)	
West	44149 (65.8)	22964 (34.2)	
Age (years)			< 0.001
mean $\pm$ SD	63.1 $\pm$ 7.8	65.7 $\pm$ 8.4	
PSA (ng/mL)			
median (Q1, Q3)	5.8 (4.6, 8.2)	5.8 (4.5, 7.8)	
Gleason Score, N (%)			< 0.001
3 + 3	50938 (53.0)	33740 (79.0)	
3 + 4	45116 (47.0)	8943 (21.0)	
Year of diagnosis, N (%)			< 0.001
2010	21197 (22.1)	6714 (15.7)	
2011	20953 (21.8)	7460 (17.5)	
2012	15975 (16.6)	6917 (16.2)	
2013	13870 (14.4)	7718 (18.1)	
2014	12050 (12.5)	6711 (15.7)	
2015	12009 (12.5)	7156 (16.8)	
Insured status, N (%)			< 0.001
Any Medicaid	3840 (4.0)	1678 (3.9)	
Insured	86065 (89.6)	34033 (79.7)	
Uninsured	1126 (1.2)	706 (1.7)	
Unknown	5023 (5.2)	6259 (14.7)	
Median Household Income quantile - in tens of dollars, N (%)			< 0.001
Poor [1897, 5065)	24541 (25.5)	10454 (24.5)	
Fair [5065, 5797)	22386 (23.3)	9716 (22.8)	
Above average [5797, 7259)	25167 (26.2)	10677 (25.0)	
Wealthy [7259, 10818]	23960 (24.9)	11829 (27.7)	
Family Poverty quantile - percentage of family under poverty line, N (%)			< 0.001
Poor [14.21, 41.75]	24466 (25.5)	10308 (24.2)	
Fair [10.29, 14.21)	23166 (24.1)	10333 (24.2)	
Above average [7.5, 10.29)	23878 (24.9)	10838 (25.4)	
Wealthy [1.74, 7.5)	24544 (25.6)	11197 (26.2)	
Education quantile - percentage under high school education, N (%)			< 0.001
Poorly educated [18.28, 38.97]	22607 (23.5)	10097 (23.7)	
Fairly educated [13.02, 18.28)	24253 (25.2)	10921 (25.6)	
Well educated [9.82, 13.02)	24121 (25.1)	11518 (27.0)	
Highly educated [1.59, 9.82)	25073 (26.1)	10140 (23.8)	
Number of Examined Cores, N (%)			< 0.001
< 12	12271 (12.8)	5580 (13.1)	
= 12	35854 (37.3)	16062 (37.6)	
> 12	16096 (16.8)	8298 (19.4)	
Unknown	31833 (33.1)	12736 (29.8)	
Number of Positive Cores, N (%)			< 0.001
≤ 2	29360 (30.6)	23103 (54.1)	
≥ 3	44053 (45.9)	11495 (26.9)	
Unknown	22641 (23.6)	8078 (18.9)	

Note: Percentage of race and region are calculated by row

Table 1.5.1 Treatment versus ratio of positive cores over examined cores regardless of unknown treatment status

Variables	Treatment		Un-adjusted Odds Ratio	P-value
	Invasive Care (N = 61,595)	**Active Surveillance** (N = 15,502)		
Positive Cores/Examined Cores			0.102	< 0.001
mean ± SD	0.35 ± 0.24	0.19 ± 0.17		

Table 1.5.2 Treatment versus ratio of positive cores over examined cores combine unknowns into active surveillance

Variables	Treatment		Un-adjusted Odds Ratio	P-value
	Invasive Care (N = 61,595)	**Active Surveillance** (N = 28,523)		
Positive Cores/Examined Cores			0.102	< 0.001
mean ± SD	0.35 ± 0.24	0.24 ± 0.21		

Table 1.5.3 Treatment versus ratio of positive cores over examined cores

Variables	Treatment			Un-adjusted Odds Ratio	P-value
	Invasive Care (N = 61,595)	**Active Surveillance** (N = 15,502)	**Unknown** (N = 13,021)		
Positive Cores/Examined Cores				0.015	< 0.001
mean ± SD	0.35 ± 0.24	0.19 ± 0.17	0.29 ± 0.25		

Table 2.1.1 Logistic regression on evaluating treatment status regardless of unknown treatment status

Variables	Unadjusted		Adjusted	
	Odds Ratio（95% CI）	**P-value**	**Odds Ratio（95% CI）**	**P-value**
Race (ref. Non-Black)				
Black	0.83 (0.79-0.86)	< 0.001	1.21 (1.15-1.27)	< 0.001
Region (ref. Midwest)				
Northeast	0.98 (0.93-1.05)	0.625	0.61 (0.57-0.67)	< 0.001
South	0.86 (0.81-0.91)	< 0.001	0.70 (0.65-0.76)	< 0.001
West	1.59 (1.51-1.67)	< 0.001	1.38 (1.28-1.48)	< 0.001
Age (per years increase)				
	1.03 (1.03-1.04)	< 0.001	1.05 (1.05-1.06)	< 0.001
PSA (ng/mL increase)				
	0.98 (0.98-0.99)	< 0.001	0.98 (0.98-0.98)	< 0.001
Gleason Score (ref. 3 + 3)				
3 + 4	0.16 (0.15-0.16)	< 0.001	0.16 (0.15-0.17)	< 0.001
Year of diagnosis (ref. 2010)				
2011	1.27 (1.20-1.34)	< 0.001	1.35 (1.28-1.43)	< 0.001
2012	1.69 (1.60-1.79)	< 0.001	1.85 (1.75-1.96)	< 0.001
2013	2.41 (2.29-2.54)	< 0.001	2.89 (2.73-3.06)	< 0.001
2014	2.42 (2.29-2.55)	< 0.001	3.21 (3.03-3.41)	< 0.001
2015	2.58 (2.44-2.72)	< 0.001	3.69 (3.48-3.92)	< 0.001
Insured status (ref. Uninsured)				
Insured	1.00 (0.87-1.15)	0.997	0.55 (0.47-0.64)	< 0.001
Any Medicaid	0.74 (0.63-0.87)	< 0.001	0.46 (0.39-0.55)	< 0.001
Unknown	1.29 (1.12-1.50)	< 0.001	0.69 (0.59-0.82)	< 0.001
Median Household Income (ref. Poor)				
Fair [5065, 5797)	1.28 (1.22-1.34)	< 0.001	1.07 (1.01-1.13)	0.031
Above average [5797, 7259)	1.38 (1.32-1.44)	< 0.001	1.10 (1.02-1.18)	0.014
Wealthy [7259, 10818]	1.73 (1.66-1.80)	< 0.001	1.25 (1.15-1.37)	< 0.001
Family Poverty (ref. Poor)				
Fair [10.29, 14.21)	1.38 (1.32-1.44)	< 0.001	1.12 (1.05-1.18)	< 0.001
Above average [7.5, 10.29]	1.54 (1.47-1.61)	< 0.001	1.13 (1.04-1.22)	0.004
Wealthy [1.74, 7.5]	1.67(1.60-1.74)	< 0.001	1.15 (1.05-1.27)	0.004
Education (ref. Poorly educated)				
Fairly educated [13.02, 18.28)	1.06 (1.01-1.10)	0.012	1.20 (1.13-1.27)	< 0.001
Well educated [9.82, 13.02)	1.33 (1.28-1.39)	< 0.001	1.41 (1.32-1.51)	< 0.001
Highly educated [1.59, 9.82]	1.10 (1.05-1.15)	< 0.001	1.12 (1.04-1.21)	0.002
Number of Examined Cores (ref. < 12)				
= 12	1.36 (1.30-1.43)	< 0.001	1.32 (1.25-1.39)	< 0.001
> 12	1.57 (1.49-1.66)	< 0.001	1.57 (1.48-1.67)	< 0.001
Unknown	0.98 (0.93-1.04)	0.523	1.14 (1.07-1.22)	< 0.001
Number of Positive Cores (ref. ≤ 2)				
≥ 3	0.24 (0.23-0.25)	< 0.001	0.30 (0.29-0.31)	< 0.001
Unknown	0.32 (0.30-0.33)	< 0.001	0.46 (0.44-0.49)	< 0.001

Note: There is no collinearities among “Median household income”, “Family poverty” and “Education” (VIF < 10)

Table 2.1.2 Variable combinations that increase the odds ratio of RACE **from 0.83 up to 1** (Based on Table 2.1.1)

Adjusted OR of race	CI	1st variable	2nd variable	3rd variable
1.073	(1.027, 1.121)	PSA	Age	Region
1.045	(1.000, 1.091)	PSA	Region	Family Poverty
1.123	(1.072, 1.175)	Gleason Score	Age	Region
1.061	(1.014, 1.110)	Gleason Score	Age	Median Household Income
1.087	(1.039, 1.137)	Gleason Score	Age	Family Poverty
1.085	(1.037, 1.136)	Gleason Score	Region	Family Poverty
1.103	(1.054, 1.153)	Age	Region	Examined Cores
1.071	(1.025, 1.119)	Age	Region	Median Household Income
1.117	(1.069, 1.167)	Age	Region	Family Poverty
1.063	(1.017, 1.111)	Age	Region	High school Education
1.085	(1.037, 1.136)	Region	Examined Cores	Family Poverty

Note: 1st, 2nd and 3rd variable means the first, second and third variable added into the adjusted model, respectively.

Table 2.2.1 Logistic regression on evaluating treatment status regardless of unknown treatment status

Variables	Unadjusted		Adjusted	
	Odds Ratio（95% CI）	**P-value**	**Odds Ratio（95% CI）**	**P-value**
Race (ref. Non-Black)				
Black	0.86 (0.82-0.91)	< 0.001	1.24 (1.17-1.32)	< 0.001
Region (ref. Midwest)				
Northeast	1.45 (1.34 -1.56)	< 0.001	0.85 (0.77-0.93)	0.001
South	1.01 (0.94-1.09)	0.715	0.73 (0.67-0.79)	< 0.001
West	2.01 (1.88-2.15)	< 0.001	1.48 (1.36-1.62)	< 0.001
Cores Ratio				
# Positive / # Examined	1.00 (1.00-1.00)	0.376	1.00 (1.00-1.00)	0.193
Age (per year increase)				
	1.03 (1.03-1.03)	< 0.001	1.05 (1.05-1.05)	< 0.001
PSA (ng/mL increase)				
	0.98 (0.98-0.99)	< 0.001	0.98 (0.98-0.98)	< 0.001
Gleason Score (ref. 3 + 3)				
3 + 4	0.15 (0.14-0.16)	< 0.001	0.12 (0.12-0.13)	< 0.001
Year of diagnosis (ref. 2010)				
2011	1.41 (1.32-1.51)	< 0.001	1.46 (1.36-1.56)	< 0.001
2012	1.75 (1.64-1.87)	< 0.001	1.99 (1.85-2.13)	< 0.001
2013	2.49 (2.34-2.65)	< 0.001	3.09 (2.89-3.31)	< 0.001
2014	2.41 (2.25-2.57)	< 0.001	3.32 (3.09-3.57)	< 0.001
2015	2.63 (2.46-2.80)	< 0.001	3.85 (3.58-4.13)	< 0.001
Insured status (ref. Uninsured)				
Insured	1.09 (0.93-1.29)	0.309	0.70 (0.58-0.84)	< 0.001
Any Medicaid	0.85 (0.70-1.03)	0.098	0.59 (0.47-0.73)	< 0.001
Median Household Income (ref. Poor)				
Fair [5065, 5797)	1.37 (1.29-1.45)	< 0.001	1.15 (1.07-1.24)	< 0.001
Above average [5797, 7259)	1.41 (1.33-1.48)	< 0.001	1.22 (1.11-1.33)	< 0.001
Wealthy [7259, 10818]	1.91 (1.82-2.01)	< 0.001	1.40 (1.26-1.56)	< 0.001
Family Poverty (ref. Poor)				
Fair [10.29, 14.21)	1.35 (1.28-1.42)	< 0.001	1.04 (0.97-1.11)	0.294
Above average [7.5, 10.29]	1.38 (1.31-1.45)	< 0.001	0.96 (0.87-1.06)	0.387
Wealthy [1.74, 7.5]	1.67(1.58-1.75)	< 0.001	1.05 (0.93-1.18)	0.447
Education (ref. Poorly educated)				
Fairly educated [13.02, 18.28)	0.99 (0.94-1.05)	0.759	1.19 (1.11-1.27)	< 0.001
Well educated [9.82, 13.02)	1.24 (1.18-1.30)	< 0.001	1.34 (1.24-1.44)	< 0.001
Highly educated [1.59, 9.82]	0.95 (0.90-1.00)	0.071	1.04 (0.95-1.13)	0.409

Notes:

1. Delete unknown insured status
2. Cores Ratio = # Positive cores/# Examined cores
3. There is no collinearities among “Median household income”, “Family poverty” and “Education” (VIF < 10)

Table 2.2.2 Variable combinations that increase the odds ratio of race **from 0.86 up to 1** (Based on Table 2.2.1)

Adj. OR of Race	95% CI	1st variable	2nd variable	3rd variable
1.065	(1.008, 1.125)	Year of diagnosis	Gleason Score	Region
1.091	(1.035, 1.150)	Year of diagnosis	Age	Region
1.089	(1.032, 1.150)	PSA	Gleason Score	Region
1.140	(1.082, 1.201)	PSA	Age	Region
1.053	(1.000, 1.109)	PSA	Age	Median Household Income
1.063	(1.010, 1.120)	PSA	Region	Median Household Income
1.095	(1.039, 1.154)	PSA	Region	Family Poverty
1.209	(1.144, 1.276)	Gleason Score	Age	Region
1.139	(1.079, 1.202)	Gleason Score	Age	Median Household Income
1.147	(1.086, 1.211)	Gleason Score	Age	Family Poverty
1.088	(1.030, 1.148)	Gleason Score	Insured Status	Region
1.081	(1.024, 1.141)	Gleason Score	Region	Core Ratio (Positive/Examined)
1.108	(1.049, 1.169)	Gleason Score	Region	Median Household Income
1.148	(1.087, 1.212)	Gleason Score	Region	Family Poverty
1.098	(1.040, 1.159)	Gleason Score	Region	High School Education
1.111	(1.055, 1.171)	Age	Insured Status	Region
1.104	(1.048, 1.163)	Age	Region	Core Ratio (Positive/Examined)
1.127	(1.069, 1.187)	Age	Region	Median Household Income
1.162	(1.102, 1.225)	Age	Region	Family Poverty
1.113	(1.056, 1.172)	Age	Region	High School Education
1.053	(1.000, 1.109)	Age	Family Poverty	High School Education
1.082	(1.027, 1.140)	Insured Status	Region	Family Poverty
1.075	(1.020, 1.132)	Region	Core Ratio (Positive/Examined)	Family Poverty
1.066	(1.012, 1.123)	Region	Median Household Income	Family Poverty
1.064	(1.010, 1.121)	Region	Family Poverty	High School Education

Note: 1st, 2nd and 3rd variable means the first, second and third variable added into the adjusted model, respectively.

Table 2.3 Logistic regression on evaluating treatment status combining unknowns into active surveillance

Variables	Unadjusted		Adjusted	
	Odds Ratio（95% CI）	**P-value**	**Odds Ratio（95% CI）**	**P-value**
Race (ref. Non-Black)				
Black	1.02 (0.99-1.05)	0.204	1.33 (1.28-1.38)	< 0.001
Region (ref. Midwest)				
Northeast	0.95 (0.91-1.00)	0.039	0.68 (0.64-0.72)	< 0.001
South	1.07 (1.02-1.11)	0.004	0.92 (0.87-0.97)	0.003
West	1.39 (1.34-1.45)	< 0.001	1.33 (1.26-1.40)	< 0.001
Age (per year increase)				
	1.04 (1.04-1.04)	< 0.001	1.05 (1.05-1.05)	< 0.001
PSA (ng/mL increase)				
	1.01 (1.01-1.01)	< 0.001	1.01 (1.01-1.01)	< 0.001
Gleason Score (ref. 3 + 3)				
3 + 4	0.30 (0.29-0.31)	< 0.001	0.30 (0.29-0.31)	< 0.001
Year of diagnosis (ref. 2010)				
2011	1.12 (1.08-1.17)	< 0.001	1.19 (1.14-1.24)	< 0.001
2012	1.37 (1.31-1.42)	< 0.001	1.48 (1.42-1.55)	< 0.001
2013	1.76 (1.69-1.83)	< 0.001	2.02 (1.93-2.11)	< 0.001
2014	1.76 (1.69-1.83)	< 0.001	2.12 (2.03-2.22)	< 0.001
2015	1.88 (1.81-1.96)	< 0.001	2.36 (2.26-2.47)	< 0.001
Insured status (ref. Uninsured)				
Insured	0.63 (0.57-0.69)	< 0.001	0.41 (0.37-0.46)	< 0.001
Any Medicaid	0.70 (0.62-0.78)	< 0.001	0.48 (0.43-0.54)	< 0.001
Unknown	1.99 (1.80-2.20)	< 0.001	1.39 (1.24-1.55)	< 0.001
Median Household Income (ref. Poor)				
Fair [5065, 5797)	1.02 (0.99-1.05)	0.267	0.97 (0.93-1.01)	0.161
Above average [5797, 7259)	1.00 (0.96-1.03)	0.804	0.99 (0.94-1.05)	0.848
Wealthy [7259, 10818]	1.16 (1.12-1.20)	< 0.001	1.16 (1.08-1.24)	< 0.001
Family Poverty (ref. Poor)				
Fair [10.29, 14.21)	1.06 (1.02-1.09)	0.001	1.00 (0.95-1.04)	0.814
Above average [7.5, 10.29]	1.08 (1.04-1.11)	< 0.001	1.04 (0.98-1.10)	0.225
Wealthy [1.74, 7.5]	1.08 (1.05-1.12)	< 0.001	1.03 (0.96-1.11)	0.455
Education (ref. Poorly educated)				
Fairly educated [13.02, 18.28)	1.01 (0.98-1.04)	0.623	1.04 (0.99-1.08)	0.089
Well educated [9.82, 13.02)	1.07 (1.04-1.10)	< 0.001	1.12 (1.07-1.18)	< 0.001
Highly educated [1.59, 9.82]	0.91 (0.88-0.94)	< 0.001	0.93 (0.88-0.98)	0.009
Number of Examined Cores (ref. < 12)				
= 12	0.99 (0.95-1.02)	0.425	1.01 (0.97-1.05)	0.665
> 12	1.13 (1.09-1.18)	< 0.001	1.18 (1.13-1.23)	< 0.001
Unknown	0.88 (0.85-0.91)	< 0.001	0.94 (0.89-0.98)	0.005
Number of Positive Cores (ref. ≤ 2)				
≥ 3	0.33 (0.32-0.34)	< 0.001	0.41 (0.40-0.42)	< 0.001
Unknown	0.45 (0.44-0.47)	< 0.001	0.59 (0.56-0.61)	< 0.001

Note: There is no collinearities among “Median household income”, “Family poverty” and “Education” (VIF < 10)

Table 2.4 Logistic regression on evaluating treatment status combining unknowns into invasive care

	Unadjusted		Adjusted	
Variables	**Odds Ratio（95% CI）**	**P-value**	**Odds Ratio（95% CI）**	**P-value**
Race (ref. Non-Black)				
Black	0.79 (0.76-0.83)	< 0.001	1.16 (1.11-1.22)	< 0.001
Region (ref. Midwest)				
Northeast	1.00 (0.94-1.06)	0.937	0.73 (0.68-0.78)	< 0.001
South	0.82 (0.77-0.87)	< 0.001	0.73 (0.68-0.78)	< 0.001
West	1.54 (1.46-1.62)	< 0.001	1.35 (1.27-1.45)	< 0.001
Age (per year increase)				
	1.02 (1.02-1.02)	< 0.001	1.04 (1.04-1.04)	< 0.001
PSA (ng/mL increase)				
	0.98 (0.98-0.98)	< 0.001	0.98 (0.97-0.98)	< 0.001
Gleason Score (ref. 3 + 3)				
3 + 4	0.18 (0.17-0.18)	< 0.001	0.19 (0.18-0.20)	< 0.001
Year of diagnosis (ref. 2010)				
2011	1.26 (1.20-1.33)	< 0.001	1.31 (1.24-1.38)	< 0.001
2012	1.66 (1.57-1.75)	< 0.001	1.73 (1.64-1.83)	< 0.001
2013	2.30 (2.19-2.42)	< 0.001	2.59 (2.45-2.74)	< 0.001
2014	2.31 (2.19-2.44)	< 0.001	2.83 (2.67-3.00)	< 0.001
2015	2.43 (2.30-2.56)	< 0.001	3.16 (2.98-3.34)	< 0.001
Insured status (ref. Uninsured)				
Insured	1.20 (1.05-1.37)	0.007	0.77 (0.67-0.89)	< 0.001
Any Medicaid	0.82 (0.70-0.95)	0.010	0.61 (0.52-0.72)	< 0.001
Unknown	0.93 (0.80-1.07)	0.296	0.47 (0.40-0.55)	< 0.001
Median Household Income (ref. Poor)				
Fair [5065, 5797)	1.32 (1.26-1.38)	< 0.001	1.10 (1.04-1.17)	0.001
Above average [5797, 7259)	1.46 (1.39-1.52)	< 0.001	1.13 (1.06-1.21)	0.001
Wealthy [7259, 10818]	1.81 (1.74-1.89)	< 0.001	1.23 (1.12-1.33)	< 0.001
Family Poverty (ref. Poor)				
Fair [10.29, 14.21)	1.42 (1.36-1.48)	< 0.001	1.15 (1.09-1.21)	< 0.001
Above average [7.5, 10.29]	1.61 (1.54-1.68)	< 0.001	1.16 (1.08-1.26)	< 0.001
Wealthy [1.74, 7.5]	1.77 (1.70-1.85)	< 0.001	1.22 (1.11-1.34)	< 0.001
Education (ref. Poorly educated)				
Fairly educated [13.02, 18.28)	1.06 (1.02-1.11)	0.004	1.18 (1.12-1.25)	< 0.001
Well educated [9.82, 13.02)	1.37 (1.32-1.43)	< 0.001	1.39 (1.31-1.48)	< 0.001
Highly educated [1.59, 9.82]	1.16 (1.11-1.21)	< 0.001	1.15 (1.08-1.24)	< 0.001
Number of Examined Cores (ref. < 12)				
= 12	1.45 (1.38-1.52)	< 0.001	1.40 (1.33-1.48)	< 0.001
> 12	1.63 (1.54-1.72)	< 0.001	1.64 (1.55-1.74)	< 0.001
Unknown	1.02 (0.97-1.08)	0.357	1.23 (1.16-1.31)	< 0.001
Number of Positive Cores (ref. ≤ 2)				
≥ 3	0.27 (0.26-0.28)	< 0.001	0.35 (0.34-0.37)	< 0.001
Unknown	0.35 (0.33-0.36)	< 0.001	0.49 (0.47-0.52)	< 0.001

Table 3.1 Characteristics of patients in treatment status between Black and non-Black groups in each region (regardless of unknown treatment status)

Region	Treatment, N (%)	Race		Adj. OR	95% CI
Midwest		Black (N = 2,211)	Non-Black (N = 9,552)	1.2639	(1.0851, 1.4706)
	Invasive Care	1823 (82.5)	8227 (86.1)		
	Active Surveillance	388 (17.5)	1325 (13.9)		
Northeast		Black (N = 2,201)	Non-Black (N = 15,294)	0.8034	(0.6998, 0.9203)
	Invasive Care	1909 (86.7)	12811 (83.8)		
	Active Surveillance	292 (13.3)	2483 (16.2)		
South		Black (N = 7,873)	Non-Black (N = 18,823)	1.0803	(0.9883, 1.1802)
	Invasive Care	6922 (87.9)	16158 (85.8)		
	Active Surveillance	951 (12.1)	2665 (14.2)		
West		Black (N = 5,108)	Non-Black (N = 50,522)	1.4141	(1.3093, 1.5267)
	Invasive Care	3843 (75.2)	39338 (77.9)		
	Active Surveillance	1265 (24.8)	11184 (22.1)		

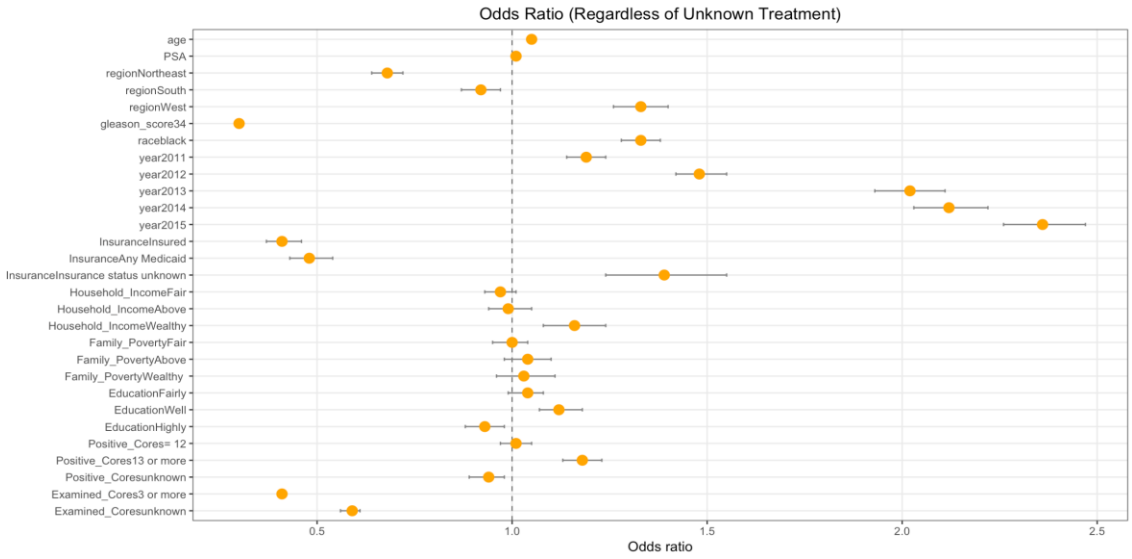
Table 3.2 Characteristics of patients in treatment status between Black and non-Black groups in each region (combine unknowns into active surveillance)

Region	Treatment, N (%)	Race		Adj. OR	95% CI
Midwest		Black (N = 2,812)	Non-Black (N = 11,552)	1.3286	(1.1799, 1.4955)
	Invasive Care	1934 (68.8)	8518 (73.7)		
	Active Surveillance	878 (31.2)	3034 (26.3)		
Northeast		Black (N = 3,374)	Non-Black (N = 20,405)	1.0157	(0.9241, 1.1156)
	Invasive Care	2555 (75.7)	14977 (73.4)		
	Active Surveillance	819 (24.3)	5428 (26.6)		
South		Black (N = 10,247)	Non-Black (N = 23,230)	1.3016	(1.2254, 1.3824)
	Invasive Care	7224 (70.5)	16699 (71.9)		
	Active Surveillance	3023 (29.5)	6531 (28.1)		
West		Black (N = 6,125)	Non-Black (N = 60,911)	1.5136	(1.4241, 1.6086)
	Invasive Care	3887 (62.5)	40268 (66.1)		
	Active Surveillance	2328 (37.5)	20643 (33.9)		

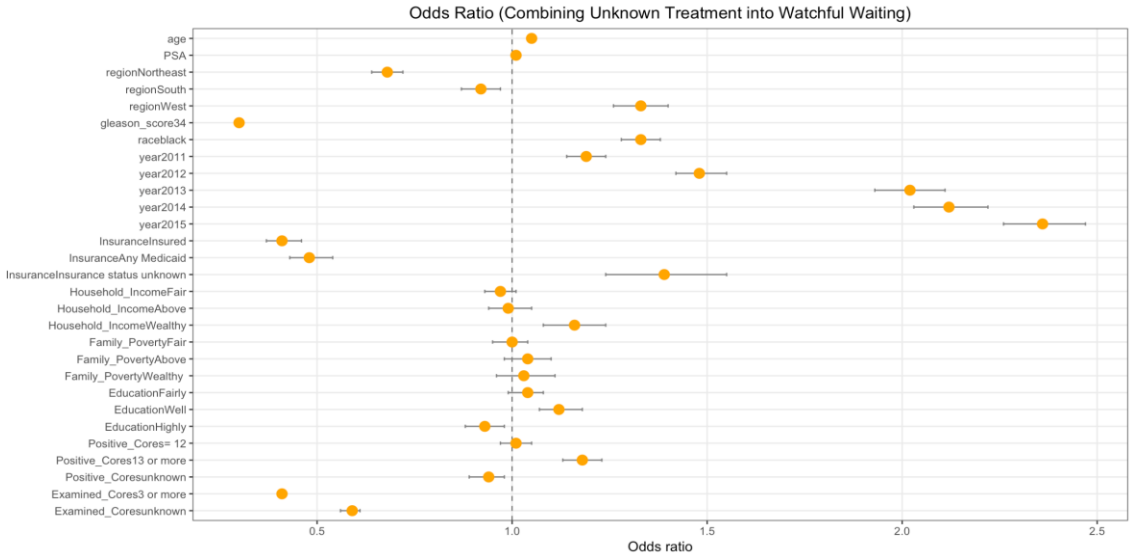
Table 3.3 Characteristics of patients in treatment status between Black and non-Black groups in each region (combine unknowns into invasive care)

Region	Treatment, N (%)	Race		Adj. OR	95% CI
Midwest		Black (N = 2,812)	Non-Black (N = 11,552)	1.3167	(1.1413, 1.5174)
	Invasive Care	2388 (84.9)	10029 (86.8)		
	Active Surveillance	424 (15.1)	1523 (13.2)		
Northeast		Black (N = 3,374)	Non-Black (N = 20,405)	0.7988	(0.6987, 0.9111)
	Invasive Care	3036 (90.0)	17527 (85.9)		
	Active Surveillance	338 (10.0)	2878 (14.1)		
South		Black (N = 10,247)	Non-Black (N = 23,230)	1.0148	(0.9320, 1.1044)
	Invasive Care	9240 (90.2)	20419 (87.9)		
	Active Surveillance	1007 (9.8)	2811 (12.1)		
West		Black (N = 6,215)	Non-Black (N = 60,911)	1.3113	(1.2194, 1.4095)
	Invasive Care	4940 (79.5)	49132 (80.7)		
	Active Surveillance	1275 (20.5)	11779 (19.3)		

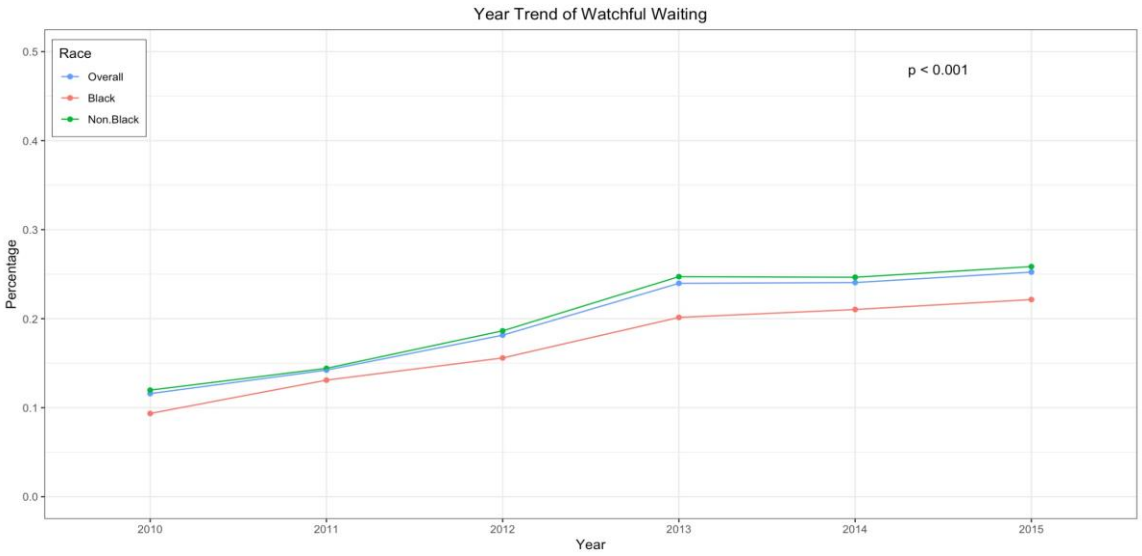
Graph 1.1 Plot of logistic regression on evaluating treatment status with interactions between race of patients and their locations (Regardless of unknown treatment status)



Graph 1.2 Plot of logistic regression on evaluating treatment status with interactions between race of patients and their locations (combine unknowns into active surveillance)



Graph 2.1. Change of percentage in number of patients choosing active surveillance from 2010 to 2015 by race



Graph 2.2. Change of percentage in number of patients choosing active surveillance from 2010 to 2015 by region