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Racial/Ethnic Disparity in Treatment for Prostate Cancer: Does Cancer Severity Matter

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Abstract

Objectives—To determine if there are variations in the receipt of treatment based on race and disease severity. Treatment variations in men with prostate cancer among the various racial groups in the US exist, which may be a source of potential disparity in outcome.

Methods—Utilizing Surveillance, Epidemiology and End Results (SEER) -17, we identified 327,636 men diagnosed with prostate cancer from 2004–2011. Logistic regression analysis was performed to determine the association of receiving definitive treatment and race in the context of disease severity.

Results—African-American and Hispanic men were less likely to receive treatment compared to White men (OR 0.73, 95% CI 0.71,0.75; and OR 0.95, 95% CI 0.92,0.98; respectively). African-American men had significantly lower odds ratio of receiving definitive treatment within each D'Amico risk classification compared to White men, with decreasing odds of treatment for each increase in risk category (Low risk OR 0.81, 95% CI 0.78,0.85; Intermediate risk OR 0.74, 95% CI 0.71,0.77; and High risk OR 0.62, 95% CI 0.58,0.66). Hispanic men with intermediate risk (OR 0.89, 95% CI 0.84,0.94) or high risk (OR 0.79, 95% CI 0.72,0.85) disease had lower odds of receiving treatment compared to White men. Asian men had similar or greater odds of receiving treatment compared to White men within any Gleason or D'Amico classification.

Conclusions—There is a significant disparity in the receipt of treatment for prostate cancer among AA and Hispanic men compared to White men. The variations in receipt of treatment

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reveal an area of opportunity to develop risk-stratified approaches to treatment regardless of ethnic identity, which may address the poorer prostate cancer-related outcomes in these populations.

Keywords

Prostate cancer; disparities; race and ethnicity

Introduction

Despite a reduction in prostate cancer (PCa) mortality over the last three decades, racial differences in PCa mortality still exist. For example, African American (AA) men continue to have a 2.4-fold risk of death compared to White men.¹ Being diagnosed at a younger age and with more aggressive disease have been reported to contribute to the mortality disparity^{2–4}; however, studies controlling for disease characteristics as well as sociodemographic factors do not completely explain the disparity in outcome.⁵

Despite a higher risk of more aggressive disease, it has been reported that AA men are less likely to receive treatment.^{6–8} The lower rate of receipt of treatment in AA men may play a significant role in PCa mortality disparity.^{9, 10} Treatment trends in Hispanic men with PCa have not been reported as extensively as in AA men; however, data from a decade ago indicated that Hispanic men were as likely to receive curative treatment for localized disease.¹⁰ Epidemiological evidence demonstrates that Asian men have lower PCa incidence but worse pathological features^{11, 12}; however, there are few data regarding treatment trends among Asian men compared to other US populations. The purpose of this study is to examine racial/ethnic differences in treatment by cancer aggressiveness (Gleason sum) and D'Amico risk classification.

Methods

The study was conducted using Surveillance, Epidemiology, and End Results Registry 17 (SEER-17). The study cohort consisted of 327,641 men diagnosed from 2004–2011 with clinically localized PCa. Men excluded from the study included those with “death certificate and autopsy” only detected PCa, pre-treatment data indicating advanced stage, non-localized PCa (clinical T3b and PSA >40ng/ml) and missing data on variables of interest (race/ethnicity, age, grade, American Joint Committee on Cancer (AJCC) stage, prostate specific antigen (PSA), SEER site, and treatment received). Of note less than 4% of men were excluded secondary to missing data on variables of interest. Men were grouped into the following racial groups using SEER race code variables African American (Non-Hispanic black/African American), Hispanic Origin Recode NHIA recode, White (Race code Non-Hispanic Whites) and Asian (race code combined Asian Pacific Islanders and Alaskan natives). Marital status was reclassified as married and non-married (single, divorced or widowed). The treatment categories were classified using SEER treatment variables and were defined as receiving radical prostatectomy (RP), external beam radiation (RT), brachytherapy, combination therapy (brachytherapy and RT or RP and RT) and cryotherapy. Men were classified as not receiving treatment (watchful waiting (WW) or active surveillance (AS)) if not receiving any of the aforementioned treatments.

Statistical Analysis

The means for continuous variables (PSA and age) were analyzed using *t-test* with unequal variances for between group comparisons. Chi-square test was used to assess between group differences for categorical variables (race/ethnicity, age, treatment, Gleason sum, marital status, year of diagnosis, SEER site and D'Amico risk classification).

Multivariable logistic regressions were conducted to evaluate the association between race/ethnicity and treatment received and whether these associations varied as a function of either Gleason sum or D'Amico risk classification. For all models, the outcome was having received definitive versus non-definitive treatment and the common covariates were SEER registry, marital status, and year of diagnosis. Due to previously identified discrepancies with PSA data within the SEER dataset¹³, we performed all logistic regression analysis without PSA, and defined the D'Amico classification with Gleason sum and T-classification only. To disambiguate the interaction between race/ethnicity and Gleason sum we conducted logistic regressions predicting treatment as a function of race/ethnicity for each level of Gleason sum (Gleason = 6, Gleason=7, and Gleason=8–10). The final model evaluates the interaction between race/ethnicity and D'Amico classification. We performed subset analyses to test associations between race/ethnicity and treatment at each level of D'Amico risk classification (low, intermediate and high risk). All statistical analysis was performed using STATA version 12 Statistical software, **StataCorp LP** College Station, TX.

Results

Table 1 summarizes the demographic and clinical data of the cohort. AA men were significantly younger (Mean Age: AA 63, Hispanic 65, White 66, and Asian 67) and had a significantly lower percentage of men diagnosed with Gleason = 6 disease compared to Hispanic and White men, but a significantly higher percentage than Asian men (AA 45.7%, Hispanic 50.6%, White 48.4%, and Asian 43.6%). A higher percentage of AA men received RT (26.8%) compared to Hispanic and White men (25.5% and 22.7%, respectively), but a lower percentage than Asian men (27.5%). A smaller percentage of White men received RT compared to all other groups. A significantly higher percentage of AA and Hispanic men received WW/AS (22.8% and 22.6%, respectively) compared to White and Asian men (20.1% and 21.4%, respectively) (within group differences $p<0.001$, data not shown).

Racial/ethnic differences in the adjusted odds of receiving definitive treatment are shown in Table 2. AA and Hispanic men were less likely to receive therapy compared to White men (OR 0.73; 95% CI: 0.71,0.75, and OR 0.95; 95% CI:0.92,0.98, respectively, both $p<0.001$). Compared to men 60–69 years of age, men less than 60 years of age were more likely to receive treatment, whereas men greater than 70 years of age were less likely to receive treatment. Married men were more than twice as likely to receive treatment (OR 2.14; 95% CI: 2.10,2.18, $p<0.001$). Compared to men diagnosed with Gleason = 6 disease, men with Gleason 7 and 8–10 disease had significantly higher odds of receiving definitive treatment (OR 2.56; 95% CI: 2.51,2.61, and OR 2.27; 95% CI: 2.20,2.33, respectively, both $p<0.001$). There were decreasing odds of receipt of treatment from 2004 to 2011.

Table 3 demonstrates the odds of receipt of treatment in terms of Gleason sum and race/ethnicity compared to a White man with Gleason 6 disease.

As would be expected for increasing severity of disease, White men with Gleason 7 and Gleason 8–10 had significantly greater odds of receiving treatment compared to White men with Gleason 6 disease (OR 2.68, CI: 2.61,2.75, and OR 2.39, CI: 2.31,2.47, respectively; both $p<0.001$). However, AA men with Gleason 6, Gleason 7 and Gleason 8–10 disease had significantly lower odds of receiving treatment compared to White men with Gleason 6 disease, with significantly decreasing odds of receiving treatment for increasing disease severity (Gleason grade) (OR 0.84, CI:0.81,0.87, OR 0.74, CI: 0.70,0.78, and OR 0.71, CI: 0.65,0.76, respectively; all $p<0.001$). Hispanic men with Gleason 6 disease had similar odds of receiving treatment compared to White men with Gleason 6 disease. However, in a similar reverse trend seen among AA men, Hispanic men with Gleason 7 and Gleason 8–10 disease had significantly lower odds of receiving treatment compared to White men with Gleason 6 disease (OR 0.86, CI: 0.80,0.92, and OR 0.81, CI: 0.73,0.89, respectively; both $p<0.001$). Asian men were as likely or more likely to receive treatment within all categories compared to White men with Gleason 6 disease.

We conducted a follow-up comparison stratified by Gleason sum to determine the odds of receipt of definitive treatment within each Gleason category (data not shown). Within each Gleason sum category, AA men were less likely to receive definitive treatment compared to White men [Gleason 6 (OR 0.82; CI: 0.80,0.86, $p<0.001$), Gleason 7 (OR 0.62; 95% CI: 0.60,0.66, $p<0.001$), and Gleason 8–10 (OR 0.61; 95% CI: 0.57,0.66, $p<0.001$)]. Compared to White men, Hispanic men were less likely to receive definitive treatment among men diagnosed with Gleason 7 (OR 0.83; 95% CI: 0.78,0.88, $p<0.001$) and Gleason 8–10 (OR 0.76; 95% CI: 0.70,0.84, $p<0.001$) disease. Asian men did not demonstrate any significant differences compared to Whites for any of the Gleason sum categories.

Compared to White men diagnosed with D'Amico low, intermediate and high risk disease without PSA, AA men diagnosed within each category (low, intermediate and high risk disease) had significantly lower odds of receiving definitive treatment (low risk- OR 0.81; 95% CI: 0.78,0.85, intermediate risk- OR 0.74; 95% CI: 0.71,0.77, and high risk- OR 0.62; 95% CI: 0.58,0.66; all $p<0.001$), with decreasing odds of treatment for each increase in risk category (Table 4). Among men with low risk disease, Hispanic men had higher odds of receiving definitive treatment compared to White men OR 1.06; 95%CI: 1.01,1.12, $p=0.019$); however, they had significantly lower odds of receiving treatment among men diagnosed with intermediate or high risk disease (OR 0.89; 95% CI: 0.84,0.94, $p<0.001$ and OR 0.79; 95% CI: 0.72,0.85, $p<0.001$, respectively). Among all D'Amico risk classification categories, Asian men had similar odds of receiving definitive treatment compared to White men. A similar analysis with the full D'Amico model including PSA yielded virtually identical ORs and trends for AA and Hispanic men, with decreased treatment among men diagnosed with intermediate and high risk disease (data not shown).

The odds of receiving treatment among men diagnosed within each SEER site according to racial/ethnic grouping is presented in Supplementary Table 1. AA men had significantly lower odds of receiving treatment among men diagnosed in 9 SEER sites (Connecticut,

Metro Detroit, Seattle/Puget Sound, Metro Atlanta, Los Angeles, Greater California, Louisiana, New Jersey, and Greater Georgia). AA men had non-significantly lower odds of receiving treatment among men diagnosed in 4 SEER sites (San Francisco/Oakland, Iowa, Utah, Kentucky), and non-significantly greater odds of receiving treatment among men diagnosed in 4 SEER sites (Hawaii, New Mexico, San Jose/Monterey, and Rural Georgia). Alaska Native SEER site data were indeterminable due to a low number (n=96) of events. Hispanic men had significantly lower odds of receiving treatment among men diagnosed in Seattle/Puget Sound, Metro Atlanta, and Los Angeles. All other regions showed no significant differences. Asian men had significantly higher odds of receiving treatment among men diagnosed in Hawaii and significantly lower odds of treatment among men diagnosed in New Mexico, Utah, Greater California, and New Jersey.

Discussion

This study demonstrates a racial disparity in the receipt of treatment for clinically localized PCa. AA men were significantly less likely to receive definitive therapy, regardless of tumor grade or D'Amico risk classification compared to White men. In fact, AA men diagnosed with Gleason 7 and Gleason 8–10 disease were significantly less likely to receive treatment compared to White men with similar or lower grade disease. Despite the fact that younger men were more likely to receive definitive treatment, AA men (a group that is significantly younger than the White cohort) were less likely to receive treatment overall. We also show regional variation in the receipt of treatment of AA men compared to White men. The most striking finding is that in regions reporting >12,000 men, AA men were significantly less likely to receive treatment, except in San Francisco/Oakland, Iowa and Kentucky. Iowa and Kentucky have quite low numbers of AA men within their cohorts, so comparisons between AA and Whites are difficult due to the imbalance. What these data primarily show is that in large metropolitan areas, where there is no shortage of prostate cancer specialists, AA men have less access to specialty care. This reduced access is likely socioeconomically driven, but the impact of race/ethnicity cannot be discounted as there are certainly some White men of low socioeconomic status contained within each region. There is ample evidence that definitive treatment impacts survival and AA experience favorable outcomes when receiving definitive treatment.^{9, 14} The determinants of cancer survival are multifactorial; however, the majority of the differences in survival between racial/ethnic groups have been reported to be secondarily to treatment disparity¹⁵, thus, emphasizing the importance of receiving definitive treatment among AA men, especially those with high-risk disease.

Previous studies have reported variations in the receipt of treatment for PCa based on race/ethnicity.^{6–8} Despite the robust literature describing this disparity over more than 30 years, it appears that little improvement has been made when examining more recent data. One possible explanation for AA men being less likely to receive definitive treatment is AA men have greater comorbidity.^{16, 17} However, to the best of our knowledge, there is no robust literature demonstrating that AA men presenting with PCa are significantly sicker than other racial/ethnic groups and therefore less likely to be candidates for definitive treatment. In fact, demographic information indicates that AA men are diagnosed at a younger age than all other racial/ethnic groups, and prior research shows that there are no significant differences in comorbid disease at the time of diagnosis.^{18–20} In a study among elderly men

that adjusted for comorbid disease, tumor grade and tumor size, AA men were less likely to receive definitive treatment despite having a significant prostate cancer survival benefit when receiving definitive treatment.²¹ The current study demonstrates lower odds of receiving any definitive treatment, even among men with high risk PCa. Therefore, it is not reasonable to believe that this finding is the result of AA men having higher comorbid disease status at the time of diagnosis. Moreover, if AA men are significantly more comorbid, then it begs the question as to why screening, biopsy and other non-surgical treatments are being performed.

The current controversy regarding potential overtreatment of PCa does not appear to apply to men of medically under-represented populations, particularly those with high-risk disease, who are consistently receiving less definitive treatment compared to White men with similar or less aggressive disease. We show that AA men with high risk disease are less likely to receive definitive therapy than White men with low risk disease. One could argue that White men with low risk disease are being overtreated, and AA men with high-risk disease are actually receiving treatment appropriately. However, we show that within groups (i.e. Gleason sum or D'Amico risk), race/ethnicity becomes the dividing line of receipt vs non-receipt of definitive treatment, especially among men with high-risk disease. Another argument that one could make is that at least AA men with low risk disease are less likely to receive definitive treatment compared to White men, thus reducing their exposure to overtreatment. However, data from Johns Hopkins show that AA men with very low risk disease are at significant risk of disease reclassification (upgrading) when on AS, and are more likely to demonstrate adverse pathologic features after prostatectomy.^{22, 23} Therefore, a significant percentage of AA men classified as low risk disease may in fact harbor high risk disease and are being undertreated. To add to this, it has been previously reported that compared to White men, AA are monitored less frequently when receiving WW/AS.²⁴ Taken together, one could argue that AA men may actually derive greater benefit from definitive treatment when presenting with low risk disease, which makes the current findings all the more concerning.

Another important finding in this study is the identification of an emerging treatment disparity in Hispanic men with PCa. It has been previously reported that, similar to AA men, Hispanic men were more likely to receive ADT/WW than Whites. However, by 1999, Hispanic men did not have a significant difference in the likelihood of receiving treatment.¹⁰ In another study, Hispanic men were more likely to receive RP than AA and White men, and utilization of RP increased over the study time period for Hispanics.⁷ In the current study, however, Hispanic men were less likely to receive definitive treatment compared to White men. When diagnosed with intermediate or high-risk disease Hispanic men were significantly less likely to receive treatment. Thus, the so-called "Hispanic Paradox" as it relates to PCa may be quickly dissolving over time. This represents a significant healthcare issue as the Hispanic population continues to be the fastest growing segment of the US population. Currently, the mortality rate of Hispanic men is slightly lower Whites based on data from 2003–2007.¹ However, the fact that Hispanic men are less likely to receive definitive treatment when diagnosed with intermediate and high-risk disease may become problematic over time. Men diagnosed with intermediate and high risk PCa are at significant risk of suffering PCa progression and mortality when not receiving definitive treatment.²⁵ There is no reason to believe that the natural history of PCa would be different for Hispanic

men compared to any other racial/ethnic group; therefore, one would expect that this reported treatment disparity may eventually lead to increasing mortality for Hispanic men as the natural history of PCa progresses.

Lastly, we present one of the largest analyses of treatment trends for Asian men with PCa. We show that although Asian men were older and had more advanced disease at the time of diagnosis, they were at least as likely to receive treatment compared to White men, and more likely than AA and Hispanic men with similar risk disease. It is a conundrum that an older population is as likely to receive treatment as a younger population with similar or higher grade disease. These findings are consistent with a study comparing White men to Chinese, Japanese, Filipino, Korean, South Asian and Vietnamese men with incident PCa in California from 1994–2004, Asian men had better or equivalent prostate cancer-specific survival when adjusted for age, stage, grade, primary treatment, SES, and year of diagnosis.²⁶ This was true despite the overall group being older, having lower SES and more likely to be higher stage or unknown stage. Men who received surgery were significantly less likely to die from PCa compared to RT.

The data presented here identify the need for an action plan to address a disparity that has been known for greater than 20 years. The fact that AA men are experiencing no change in treatment disparity over time, and Hispanic men are experiencing a regression in definitive treatment patterns, mandates a systematic approach that goes beyond the hope of self-resolution. Eliminating health disparities for people of color can reduce direct medical expenditures by \$229 billion/year, and over 30% of direct medical expenditures for AA, Hispanics and Asians were excess costs directly attributed to health inequities.²⁷ Apropos to this report, the higher PCa incidence and mortality seen among AA men makes PCa the malignancy with the largest disparity in outcome.²⁸ Thus, reducing disparity in PCa treatment would address social justice, with the added benefit of cost-effectiveness.²⁷

One limitation to consider is that SEER does not collect information on comorbidity or other variables that may lead to selection bias. However, there would have to be a massive racial/ethnic difference among men diagnosed with PCa that have less than 10 year survival, particularly in the high risk category, in order to alter our findings. Utilization of SEER-Medicare as a data source would allow for analysis of the impact of comorbidity on treatment patterns and/or treatment intensity; however, previous data from SEER-Medicare has already shown that AA men benefit from receiving treatment²¹, and restricting the analysis to men older than 65 prevents meaningful conclusions in AA men who are shown to be younger when diagnosed with PCa. As previously mentioned, this potential difference in health status between racial groups is not substantiated in the literature. Additionally, while there are significant socioeconomic factors that affect length and quality of life among AAs, both AA and White men can expect an average life expectancy greater than 25 years after reaching age 50.^{29, 30} Another limitation is that we are unable to account for patient preference in treatment. However, the plethora of data showing that AA men experience improved outcomes with surgery is clearly not being imparted to patients, implicating a potential lack of physician communication with patients regarding shared decision-making and discussion of benefits/risks of various treatment modalities.

Conclusions

AA and Hispanic men demonstrate significant variance in the receipt of definitive treatment for PCa compared to White and Asian men. Persistent disparities in treatment for AA and emerging disparities in Hispanic men, regardless of stage at presentation, likely represent a significant predictor of higher mortality in underserved populations. Asian men are older and have more aggressive disease at the time of diagnosis, but are as likely to receive aggressive treatment as White men. These findings in AA and Hispanic men represent a major public health concern, and merit development of strategies to reduce the mortality gap and encouraging utilization of appropriate risk-stratified treatment regardless of racial background.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Table 1

Clinical and Demographic Data, SEER 2004–2011 (n=327,636)

	African-American	Hispanic	White	Asian	p-value
Number (%)	45,864 (14.0%)	26,904 (8.2%)	238,627 (72.8%)	16,241 (5.0%)	
Mean Age±SD	63.1±8.97	65.5±9.06	66.0±8.92	67.4±8.76	<0.001
Age (years)					<0.001
<50	6.2%	3.8%	2.8%	1.9%	
50–59	29.2%	22.7%	21.6%	17.3%	
60–69	40.7%	40.3%	41.1%	39.8%	
70–79	20.4%	27.4%	27.7%	32.6%	
80	3.5%	5.8%	6.8%	8.4%	
Marital Status					<0.001
Married	56.9%	69.6%	72.9%	77.5%	
Mean PSA (ng/ml)	8.64±6.62	8.58±6.44	7.58±5.71	9.04±6.50	<0.001
PSA (ng/ml)					<0.001
1	1.5%	1.8%	2.0%	1.5%	
>1 to 2	2.2%	2.4%	2.9%	2.0%	
>2 to 4	9.8%	8.9%	12.3%	6.9%	
>4 to 10	61.8%	62.3%	64.3%	62.0%	
>10 to 20	17.8%	18.1%	14.0%	20.6%	
>20 to 40	7.0%	6.4%	4.5%	7.0%	
Gleason Sum					<0.001
6	45.7%	50.6%	48.4%	43.6%	
7	42.1%	36.8%	39.1%	39.0%	
8–10	12.3%	12.5%	12.5%	17.4%	
D'Amico Risk Class					<0.001
Low	29.9%	31.0%	31.6%	27.2%	

	African-American	Hispanic	White	Asian	p-value
Intermediate	46.4%	46.0%	46.3%	45.7%	
High	23.6%	23.0%	22.0%	27.1%	
Treatment					<0.001
RP	31.0%	38.2%	38.2%	34.2%	
RT	26.8%	25.5%	22.7%	27.5%	
Brachytherapy	9.1%	7.0%	10.9%	8.5%	
Combination	9.0%	5.3%	6.8%	7.3%	
Cryotherapy	1.2%	1.3%	1.3%	1.1%	
WW/AS	22.8%	22.6%	20.1%	21.4%	

AS- active surveillance, PSA- prostate specific antigen, RP- radical prostatectomy, RT- external beam radiation therapy, WW- watchful waiting

Table 2

Odds of Receiving Treatment [Odds Ratio (95% Confidence Interval)]

	OR (95% CI)	p-value
Race		
White	1	
AA	0.73 (0.71,0.75)	<0.001
Hispanic	0.95 (0.92,0.98)	<0.001
Asian/Other	0.98 (0.94,1.02)	NS
Age Group		
60–69	1	
<50	1.92 (1.80,2.04)	<0.001
50–59	1.53 (1.49,1.57)	<0.001
70–79	0.46 (0.45,0.47)	<0.001
80	0.10 (0.09,0.10)	<0.001
Year of Diagnosis		
2004	1	
2005	0.90 (0.87,0.94)	<0.001
2006	0.92 (0.88,0.95)	<0.001
2007	0.89 (0.86,0.93)	<0.001
2008	0.87 (0.84,0.90)	<0.001
2009	0.75 (0.72,0.78)	<0.001
2010	0.80 (0.77,0.83)	<0.001
2011	0.71 (0.68,0.73)	<0.001
Marital Status		
Non-married	1	
Married	2.14 (2.10,2.18)	<0.001
Gleason Sum		
6	1	
7	2.56 (2.51,2.61)	<0.001
8–10	2.27 (2.20,2.33)	<0.001

Logistic regression analysis adjusted for race/ethnicity, age, year of diagnosis, SEER registry site, marital status, Gleason sum, and D'Amico risk classification without PSA

AA- African-American, NS- non-significant

Table 3

Odds of Receiving Definitive Treatment, Testing for Interaction of Race/Ethnicity and Gleason Sum [Odds Ratio (95% Confidence Interval)]

	African-American	Hispanic	White	Asian/Other
Gleason 6	0.84 (0.81,0.87) p<0.001	1.01 (0.97,1.06) p=0.59	Reference	0.93 (0.88,0.98) p=0.014
Gleason 7	0.74 (0.70,0.78) p<0.001	0.86 (0.80,0.92) p<0.001	2.68 (2.61,2.75) p<0.001	1.10 (1.00,1.21) p=0.043
Gleason 8–10	0.71 (0.65,0.76) p<0.001	0.81 (0.73,0.89) p<0.001	2.39 (2.31,2.47) p<0.001	1.10 (0.98,1.24) p=0.10

Adjusted for SEER registry-San Francisco/Oakland, marital status, year of diagnosis-2004, race/ethnicity and Gleason sum.

Table 4

Odds of Receiving Treatment by D'Amico Risk Classification [Odds Ratio (95% Confidence Interval)]

	African-American	Hispanic	White	Asian
Low Risk (n=117,952)	0.81 (0.78,0.85) p<0.001	1.06 (1.01,1.12) p=0.019	Reference	0.99 (0.93,1.06) p=0.88
Intermediate Risk (n=145,185)	0.74 (0.71,0.77) p<0.001	0.89 (0.84,0.94) p<0.001	Reference	0.99 (0.93,1.07) p=0.96
High Risk (n=64,499)	0.62 (0.58,0.66) p<0.001	0.79 (0.72,0.85) p<0.001	Reference	0.91 (0.82,1.01) p=0.081

Adjusted for age 60–69, SEER registry-San Francisco-Oakland, married, year of diagnosis-2004, evaluating the interaction between race/ethnicity and D'Amico classification without PSA