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THE INFLUENCE OF ETHNIC HETEROGENEITY ON PROSTATE CANCER MORTALITY AFTER RADICAL PROSTATECTOMY IN HISPANIC/LATINO MEN: A POPULATION-BASED ANALYSIS

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Abstract

Objective—To determine if recently found disparities in prostate cancer-specific mortality among Mexican and Puerto Rican men remained true in patients undergoing radical prostatectomy; where the true grade and extent of cancer is known, and can be accounted for.

Materials and Methods—Men diagnosed with localized-regional prostate cancer who had undergone radical prostatectomy as primary treatment were identified (n= 180,794). Patients were divided into the following racial and ethnic groups: Non-Hispanic White (n= 135,358), Non-Hispanic Black (21,882), Hispanic/Latino (n= 15,559) and Asian American/Pacific Islander (n= 7,995). Hispanic/Latino men were further categorized into the following subgroups: Mexican (n= 3,323), South or Central American excluding Brazil (n= 1,296), Puerto Rican (n= 409), and Cuban (n= 218). A multivariable analysis was conducted using competing risks regression in prediction for PCSM.

Results—This analysis revealed hidden disparities in surgical outcomes for prostate cancer. In the multivariable analysis, Hispanic/Latino men (HR= 0.88, $p= 0.207$) did not show a significant difference in PCSM compared to Non-Hispanic White men. When breaking Hispanic/Latino men into their country of origin or ancestry, Puerto Rican men were found to have significantly worse

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Disclaimer: This study used the SEER database, interpretation and reporting of these data are the sole responsibility of the authors. The content of the information does not reflect the position or policy of the Government or the employers, and no official endorsement should be inferred.

PCSM compared to Non-Hispanic White men (HR= 2.55, $p= 0.004$), and Non-Hispanic Black men (HR= 2.33, $p= 0.016$).

Conclusions—Our findings reveal higher rates of PCSM for Puerto Rican men after radical prostatectomy compared to both NHW and NHB men. At minimum, these findings need further validation and should be considered in the screening and management of these men.

Keywords

Prostate cancer; prostatectomy; minority health; Hispanic/Latino

Introduction

Prostate cancer (PCa) is the most commonly diagnosed non-cutaneous malignancy among men in the United States, with 1 in 7 men having a lifetime risk of PCa. [1] Health outcomes for PCa vary significantly by race, [2, 3] likely due to disparities in access to care, screening, and treatment patterns. However, biological factors such as genetics and environmental exposures have been identified. [1] Previous studies have demonstrated that Non-Hispanic Black (NHB) men with PCa have more advanced and aggressive disease at younger ages and are more likely to die of their disease compared to Non-Hispanic White (NHW) patients. [2, 4]

Although the Hispanic/Latino community is the largest racial/ethnic minority group in the United States and constitutes more than 17.6% of the nation's total population, [5] its racial and genetic diversity is substantial. Amongst those living in the U.S., the most common country of origin or ancestry is Mexico (64.1%), followed by Puerto Rico (9.5%), El Salvador (3.7%), Cuba (3.7%), Dominican Republic (3.3%), and other Latin American countries (15.7%). [6] Across these subgroups are significant variations in language dialect, cultural practices, traditional diet, and genetic ancestry. [7] Despite the heterogeneity within this population, most studies have combined all Hispanic/Latino patients into one group, masking and over-generalizing both low and high risk sub-populations. [8] A recent review article by Stern et al [9] discusses reports of varying PCa incidence rates across Hispanic/Latino subgroups [10] and the influence of SES deprivation, [11] U.S. vs. foreign-born status, [12] and living in ethnic enclaves [12, 13] on mortality rates. Our previous analysis confirms the importance to recognize ethnic heterogeneity by revealing significant PCa-specific mortality (PCSM) disparities within Mexican American and Puerto Rican men. [14]

While our recent findings raise awareness of previously unknown disparities, in some patients the grade and extent of cancer was based on biopsy, which may underestimate the severity of the cancer. By focusing on surgical patients, we are able to account for the true grade and extent of cancer in the prostate and properly control for this in our analyses. Furthermore, by focusing on one specific treatment modality we can reduce unmeasured confounders related to treatment type, allowing for a clearer understanding of the relationship between race/ethnicity and PCa mortality. [15] Therefore, we sought to validate our previous findings regarding Hispanic/Latino heterogeneity on PCa mortality in a cohort of men undergoing radical prostatectomy (RP), where the type of treatment is held consistent and the true grade and volume of cancer can be appropriately adjusted for.

Materials and Methods

Source of Data and Patient Selection

PCa incidence and outcome data was obtained from the November 2015 submission offered by the National Cancer Institute's Surveillance, Epidemiology and End Results (SEER) program. This registry collects and publishes data on cancer incidence and survival from 18 registries throughout the United States, covering approximately 30% of the United States population. Men diagnosed with PCa from 2004–2013 (n= 565,976) were extracted from the SEER database. Exclusion criteria included Mx or M1 stage disease and definitive therapy other than radical prostatectomy (n= 385,182). Our final cohort of men with localized prostate cancer undergoing RP (n= 180,794) was categorized into racial and/or ethnic groups: NHW: (n= 135,358), NHB (n= 21,882), Hispanic/Latino (n= 15,559) and AAPI (n= 7,995). Additionally, we compared Hispanic/Latino subgroups: Mexicans (n= 3,323), Puerto Rican (n= 409), Cuban (n= 218) and South or Central American (n= 1,296). Dominicans (n= 92) were excluded from the study given the small sample size.

Race and Ethnicity Definitions

Race and ethnicity are evolving concepts used interchangeably in the medical literature. According to the U.S. Census Bureau, Hispanic or Latino individuals are those who identify with being Mexican, Puerto Rican, Cuban, Dominican, Central or South American or from a country of Spanish-speaking origin. Although others have stated that Latino refers to any person of origins from Latin America, [8] SEER database does not include Brazilians in their National Hispanic Identification Origin (NHIA) recode so they were not included in our Hispanic/Latino cohort. We used the NHIA origin recode, designed by the North American Association of Central Cancer Registries, to evaluate surnames, self-identified race and ethnicity, and birthplace to assign a code of Non-Hispanic, a specific Hispanic/Latino subgroup, or Hispanic/Latino, not otherwise specified (NOS). Only subjects who self-identify or have heavily Hispanic surnames without an Asian American/Pacific Islander (AAPI) racial background are categorized as Hispanic/Latino.

Study Variables

Variables that were evaluated include: race and/or ethnicity (NHW, NHB, Hispanic/Latino, or AAPI), ethnic subgroups (Mexican, Puerto Rican, Cuban, and South or Central American excluding Brazil), age at diagnosis, grade, disease stage summary (localized vs. regional disease), TNM staging, socioeconomic status (SES) composite score, marital status, insurance status, and residence type (rural vs urban).

Socioeconomic status composite score

Three county level variables representative of SES were collected: 1) education: Percent of adults at age 25 or older with less than a 12th grade education; 2) poverty: Percent of people living below the poverty line and 3) income: Median annual household income. Each county-level variable was standardized into values ranging from 0 to 1 (low SES to high SES). The sums of all variables for each case were equally weighted to create an SES composite score

based on previously published methodologies to provide a broad standardized measure of socioeconomic conditions. [16] A score of 5 reflects the highest category.

Statistical analysis

The cumulative incidence of PCSM for all racial and/or ethnic groups was examined. Fine-Gray competing risks regression was used for the univariable (UVA) and multivariable analyses (MVA). Age at diagnosis, disease stage summary, grade, SES composite score, insurance type, marital status and residence type were included in the MVA. Separate analyses were performed with NHW and NHB men as reference. Analyses involving competing risks were performed using R software (<http://www.r-project.org>) and all other analyses were performed using SAS (SAS institute, Cary, NC, USA). All statistical tests were two-sided and p -values <0.05 were considered statistically significant.

Results

Baseline characteristics of the patient cohort divided into racial and/or ethnic groups (NHW, NHB, Hispanic/Latino, and AAPI) are shown in Table 1. Statistically significant differences were found across these groups in age at diagnosis, marital status, grade, disease stage summary, TNM stage, SES composite score, insurance status, and residence type. Moreover, Non-Hispanic Black men were more likely to present at the lowest SES category (27.4% vs. 4.1–13.5%) and AAPI men were more likely to have a poorly differentiated disease grade (67.0% vs. 57.9–64.0%). Table 2 displays baseline characteristics for NHW, NHB, and Hispanic/Latino subgroups (Mexican, Cuban, Puerto Rican, and South or Central American excluding Brazil). Again, statistically significant differences were found for all the variables. In addition, Non-Hispanic Black men were more likely present at the lowest SES category, while Mexican men were more likely to be married, and uninsured.

Table 3 displays the UVA and MVA for PCSM risk in our cohort with NHW men as a reference. In the UVA, NHB men ($HR=1.21$, $p=0.036$) had significantly higher PCSM while Hispanic/Latino ($HR=0.98$, $p=0.837$) and AAPI ($HR=0.77$, $p=0.134$) men showed no statistical difference. With the same reference, Puerto Rican men ($HR=2.86$, $p=0.002$) showed significantly higher PCSM while Mexican ($HR=1.16$, $p=0.425$), Cuban ($HR=1.19$, $p=0.808$), and South or Central American men ($HR=1.33$, $p=0.303$) showed no statistical difference. After adjusting for all covariates in the MVA, NHB men ($HR=1.06$, $p=0.521$) no longer showed a significantly different risk for PCSM, Hispanic/Latino men ($HR=0.88$, $p=0.207$) continued to show no difference, and AAPI men ($HR=0.65$, $p=0.006$) demonstrated improved risk compared to NHW men. After adjustment in the subgroup analysis, the increased risk for Puerto Rican men ($HR=2.55$, $p=0.005$) persisted, while Mexican ($HR=0.96$, $p=0.824$), Cuban ($HR=1.11$, $p=0.887$), and South or Central American men ($HR=1.31$, $p=0.339$) continuing to show no difference. Forest plots of the UVA (Supplementary figure 1A) and MVA (Supplementary figure 1B) results with NHW men as reference are provided.

Table 4 displays the UVA and MVA results directly comparing racial/ethnic groups and Hispanic/Latino subgroups to the most at-risk population identified so far, NHB men. In the UVA, NHW ($HR=0.94$, $p=0.487$) and Hispanic/Latino men ($HR=0.88$, $p=0.311$) showed

no statistical difference while AAPI men (HR= 0.71, $p= 0.045$) showed improved PCSM compared to NHB men. Within the Hispanic/Latino subgroups, Puerto Rican men (HR= 2.72, $p= 0.004$) showed higher PCSM while Mexican (HR= 1.09, $p= 0.656$), Cuban (HR= 1.12, $p= 0.427$), and South or Central American (HR= 1.26, $p= 0.427$) showed no significant difference. After adjustment in the MVA, AAPI men (HR= 0.62, $p= 0.005$) showed improved PCSM while NHW (HR= 0.95, $p= 0.521$) and Hispanic/Latino men (HR= 0.83, $p= 0.137$) continued to show no difference. For the ethnic subgroups, Puerto Rican men (HR= 2.33, $p= 0.016$) continued to show higher PCSM while Mexican (HR= 0.95, $p= 0.809$), Cuban (HR= 0.93, $p= 0.916$), and South or Central American (HR= 1.25, $p= 0.462$) men showed no significant difference. Forest plots of the UVA and MVA results with NHB (supplemental figures 2A and 2B) men as reference are provided.

Discussion

Studies outlining temporal trends, [17] socioeconomic issues, [3] and biological differences² for PCa have been widely explored in NHB men. A recent trend analysis of PCa from 1975 to 2002 has demonstrated the decline of fatal PCa incidence after widespread PSA screening, yet incidence rates remained stable for younger men and racial disparities have persisted. [1] Such findings have called for a greater understanding of these differences and have influenced the recognition of higher rates of aggressive PCa in NHB men by the United States Preventative Services Task Force [18] and American Cancer Society. [19] A study by Latini *et al* [20] assessed the racial/ethnic differences in clinical characteristics and disease-free survival of men with localized PCa, ultimately showing that NHB men presented with higher-risk disease, had a lower disease free survival rate, and were more likely to experience disease recurrence after RP compared to their NHW counterparts. Similarly, Sundi *et al* [21] reported an analysis of 1,801 patients with very low-risk disease and eligible for active surveillance who opted for RP, and concluded that NHB men had higher rates of upgrading and adverse pathology compared to NHW men. As evidenced by the substantial research focus and specific guideline language, detecting and validating the extent of such disparities is vital in addressing health inequities to potentially discover unique biological mechanisms.

While racial disparities in PCa outcomes for the NHB population is well known, there is much more to be understood about Hispanic/Latino men. Traditionally, most studies have looked at Hispanic/Latino outcomes as a whole, ignoring subgroup heterogeneity. In a cohort of 6,365 men with localized PCa, Latini *et al* [20] conclude that Hispanic/Latino men are more similar to NHB men in sociodemographic characteristics, but are more related to NHW men in clinical presentation and disease-free survival rate. In addition, the American Cancer Society shows slightly lower PCa mortality rates for Hispanic/Latino men compared to NHW men. [22] While these findings are well established, most studies fail to account for ethnic heterogeneity within the Hispanic/Latino population. As discussed by Stern *et al*, [9] variability in PCa incidence across Hispanic/Latino subgroups can be found in many publications. A recent Florida study describes a 12% increase in PCa mortality among Hispanic/Latino men overall and a 15% increase specifically for Cuban Americans compared to NHW men. Another Florida study described an increased incidence of PCa for first-generation, U.S. born Mexican, Puerto Rican, and Cuban men compared to those born

in Mexico, Puerto Rico, and Cuba. [10] While residing in a high Hispanic/Latino enclave neighborhood has shown to improve survival, despite overall lower SES, [12] Puerto Rican men living on the island have higher mortality rates than mainland U.S. Latinos. [13] Although these previous studies demonstrate that ethnic heterogeneity across Hispanic/Latino subgroups influences PCa-related outcomes, many are based on state-specific cohorts which limit their generalizability.

In the first population-based study analyzing the influence of ethnic heterogeneity on PCSM, Chinea *et al* [14] revealed previously unknown disparities in Mexican American and Puerto Rican men compared to NHW men, independent of relevant clinical and sociodemographic covariates. Further, Puerto Rican men continued to demonstrate significantly higher risk for PCSM compared to NHB men. As previously stated, the extent of cancer detected through diagnostic biopsy in this cohort has the potential for underestimation compared to pathology based on RP. For this reason, we explore recently discovered disparities by focusing on a surgical cohort to attenuate the effect of unmeasured cofounders.

This approach demonstrates that Puerto Rican men, independent of sociodemographic and disease-related factors, maintain a significantly higher PCSM after undergoing RP compared to NHW and NHB men. Although Mexican American men did not show statistical significance within our current analysis, previous results showing higher PCSM independent of treatment type suggest that this is worth further exploration. However, as mainland Puerto Rican men have continued to show significantly worse PCSM compared to both NHW and NHB men regardless of treatment and also after undergoing RP, it becomes more evident that educational campaigns and clinical trials targeting this community are needed. Just as the overwhelming evidence behind PCa disparities in the NHB community has justifiably influenced guideline and clinical decision-making, similar consideration should be given to Puerto Rican men.

A strength of our study is the use of a contemporary population-based cancer registry. However, the SEER program has potential limitations: Although the use of imputation algorithms have been successfully described in race/ethnicity documentation, [23] the NHIA recode may potentially undercount Hispanic/Latino patients. [24] Beginning with the 2014 submission, SEER no longer provides birthplace data due to disproportional documentation rates in living vs. deceased cases. Immigrants constitute a significant portion of the Hispanic/Latino community and the absence of such information limits our ability to account for potential differences between U.S. and foreign-born Hispanic/Latino men. Therefore, while an increased risk of PCSM was seen in Puerto Rican men, we cannot comment on any risk difference between those raised in their country of origin versus those brought up in the U.S, as this was beyond the scope of the study. PSA level data was not made available on the 2015 SEER data release due to debatable accuracy and was not included in this analysis. Likewise, Gleason score was also not included since SEER started collecting it in 2004, and if we were to include only patients with this information, 60% of our cohort would be lost, resulting in small numbers in certain race/ethnicity subgroups, preventing any reliable analysis. Even though the current pathology may not be translated as easily into a Gleason score, this was not a main predictor in the analysis, but a factor we wanted to control for. Hence, the pathological staging provided by SEER was used.

In summary, our data indicates that ethnic heterogeneity among Hispanic/Latino subgroups in the United States significantly contributes to PCSM in patients who have undergone RP for definitive treatment. Furthermore, we have identified that significant disparities exist in this population for Puerto Rican men compared to NHW and NHB men. This study validates previously identified disparities in mainland Puerto Rican men. [14] By recognizing the country of origin or ancestry and accounting for ethnic heterogeneity within Hispanic/Latino men, future studies can measure true outcomes to properly inform policies in addressing PCa disparities.

In conclusion, our findings confirm that ethnic heterogeneity within Hispanic/Latino men is an influential factor for PCSM risk after definitive RP treatment of local-regional disease. We have identified that Puerto Rican men demonstrate significantly higher rates of PCSM when compared to both NHW and NHB men. At minimum, the risks of Puerto Rican men diagnosed within the U.S. should be considered in future screening and management guidelines.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Table 1
Patient, tumor, and treatment characteristics for radical prostatectomy patients divided by race and/or ethnic group

Variable	All N (%)	Non-Hispanic White N (%)	Non-Hispanic Black N (%)	Hispanic/Latino N (%)	Asian American/Pacific Islander N (%)	p-value
Total patients	180,794	135,358	21,882	15,559	7,995	
Age at diagnosis (mean ± SD)	61.2 ± 7.4	61.5 ± 7.3	58.7 ± 7.4	61.2 ± 7.6	63 ± 7.1	< 0.0001
Marital status						< 0.0001
<i>Married</i>	138,839 (76.8)	106,539 (78.7)	13,816 (63.1)	11,804 (75.9)	6,680 (83.6)	
<i>Others</i>	32,255 (17.8)	21,732 (16.1)	6,690 (30.6)	2,883 (18.5)	950 (11.9)	
<i>Unknown</i>	9,700 (5.4)	7,087 (5.2)	1,376 (6.3)	872 (5.6)	365 (4.6)	
Insurance status						< 0.0001
<i>Uninsured</i>	1,860 (1.0)	983 (0.7)	470 (2.1)	332 (2.1)	75 (0.9)	
<i>Any Medicaid</i>	4,303 (2.4)	1,754 (1.3)	913 (4.2)	1,133 (7.3)	503 (6.3)	
<i>Insured</i>	124,759 (69.0)	94,697 (70.0)	14,827 (67.8)	9,861 (63.4)	5,374 (67.2)	
<i>Unknown</i>	49,872 (27.6)	37,924 (28.0)	5,672 (25.9)	4,233 (27.2)	2,043 (25.6)	
pT stage						< 0.0001
<i>pT2</i>	142,358 (78.7)	106,806 (78.9)	17,318 (79.1)	12,188 (78.3)	6,046 (75.6)	
<i>pT3</i>	35,399 (19.6)	26,405 (19.5)	4,136 (18.9)	3,065 (19.7)	1,793 (22.4)	
<i>pT4</i>	3,032 (1.7)	2,143 (1.6)	427 (2.0)	306 (2.0)	156 (2.0)	
<i>pTX</i>	5 (0.0)	4 (0.0)	1 (0.0)	.	.	
N stage						< 0.0001
<i>NO</i>	175,525 (97.1)	131,497 (97.1)	21,215 (97.0)	15,032 (96.6)	7,781 (97.3)	
<i>N1</i>	4,315 (2.4)	3,167 (2.3)	558 (2.6)	422 (2.7)	168 (2.1)	
<i>NX</i>	954 (0.5)	694 (0.5)	109 (0.5)	105 (0.7)	46 (0.6)	
SES composite score						< 0.0001
<i>1</i>	36,064 (19.9)	28,898 (21.3)	2,675 (12.2)	1,743 (11.2)	2,748 (34.4)	
<i>2</i>	36,647 (20.3)	30,076 (22.2)	2,595 (11.9)	2,270 (14.6)	1,706 (21.3)	
<i>3</i>	35,841 (19.8)	29,554 (21.8)	3,401 (15.5)	1,978 (12.7)	908 (11.4)	
<i>4</i>	45,501 (25.2)	28,481 (21.0)	7,223 (33.0)	7,492 (48.2)	2,305 (28.8)	
<i>5</i>	26,721 (14.8)	18,335 (13.5)	5,987 (27.4)	2,071 (13.3)	328 (4.1)	
<i>Unknown</i>	20 (0.0)	14 (0.0)	1 (0.0)	5 (0.0)	.	

Variable	All	Non-Hispanic White	Non-Hispanic Black	Hispanic/Latino	Asian American/Pacific Islander	p-value
	N (%)	N (%)	N (%)	N (%)	N (%)	
Stage summary						
Localized	12,7000 (70.2)	95,619 (70.6)	15,351 (70.2)	10,746 (69.1)	5,284 (66.1)	< 0.0001
Regional	53,794 (29.8)	39,739 (29.4)	6,531 (29.8)	4,813 (30.9)	2,711 (33.9)	
Residence type						
Rural	2,207 (1.2)	2,061 (1.5)	115 (0.5)	29 (0.2)	2 (0.0)	< 0.0001
Urban	178,567 (98.8)	133,283 (98.5)	21,766 (99.5)	15,525 (99.8)	7,993 (100)	
Unknown	20 (0.0)	14 (0.0)	1 (0.0)	5 (0.0)		
Grade						
Well differentiated	1,320 (0.7)	972 (0.7)	127 (0.6)	166 (1.1)	55 (0.7)	< 0.0001
Moderate differentiated	66,829 (37.0)	50,633 (37.4)	7,498 (34.3)	6,209 (39.9)	2,489 (31.1)	
Poorly differentiated	110,778 (61.3)	82,397 (60.9)	14,013 (64.0)	9,014 (57.9)	5,354 (67.0)	
Undifferentiated	355 (0.2)	250 (0.2)	55 (0.3)	32 (0.2)	18 (0.2)	
Unknown	1,512 (0.8)	1,106 (0.8)	189 (0.9)	138 (0.9)	79 (1.0)	

Table 2
Patient, tumor, and treatment characteristics for radical prostatectomy patients divided by race and/or ethnic group.

Variable	All N (%)	Non-Hispanic White N (%)	Non-Hispanic Black N (%)	Mexican N (%)	Cuban N (%)	Puerto Rican N (%)	South/Central American N (%)	p-value
Total patients	172,707	145,469	21,992	3,323	218	409	1,296	
Age at diagnosis (mean $\pm$ SD)	61.5 (7.3)	61.5 $\pm$ 7.3	58.7 $\pm$ 7.4	63.7 (8.2)	60.3 (7.6)	60.9 (7.5)	61.5 (7.3)	< 0.0001
Marital status								< 0.0001
<i>Married</i>	132,099 (76.5)	114,108 (78.4)	13,889 (63.2)	2,673 (80.4)	161 (73.9)	276 (67.5)	992 (76.5)	
<i>Others</i>	31,279 (18.1)	23,637 (16.2)	6,722 (30.6)	504 (15.2)	51 (23.4)	114 (27.9)	251 (19.4)	
<i>Unknown</i>	9,329 (5.4)	7,724 (5.3)	1,381 (6.3)	146 (4.4)	6 (2.8)	19 (4.6)	53 (4.1)	
Insurance status								< 0.0001
<i>Uninsured</i>	1,776 (1.0)	1,156 (0.8)	473 (2.2)	86 (2.6)	3 (1.4)	6 (1.5)	52 (4.0)	
<i>Any Medicaid</i>	3,791 (2.2)	2,261 (1.6)	917 (4.2)	440 (13.2)	10 (4.6)	30 (7.3)	133 (10.3)	
<i>Insured</i>	119,322 (69.1)	101,517 (69.8)	14,895 (67.7)	1,796 (54)	143 (65.6)	260 (63.6)	711 (54.9)	
<i>Unknown</i>	47,818 (27.7)	40,535 (27.9)	5,707 (26)	1,001 (30.1)	62 (28.4)	113 (27.6)	400 (30.9)	
pT stage								0.0044
<i>pT2</i>	136,234 (78.9)	114,786 (78.9)	17,400 (79.1)	2,545 (76.6)	172 (78.9)	307 (75.1)	1,024 (79.0)	
<i>pT3</i>	33,593 (19.5)	28,337 (19.5)	4,161 (18.9)	708 (21.3)	42 (19.3)	94 (23.0)	251 (19.4)	
<i>pT4</i>	2,875 (1.7)	2,342 (1.6)	430 (2.0)	70 (2.1)	4 (1.8)	8 (2.0)	21 (1.6)	
<i>pTX</i>	5 (0.0)	4 (0.0)	1 (0.0)	.	.	.	.	
N stage								0.0035
<i>NO</i>	167,656 (97.1)	141,296 (97.1)	21,320 (96.9)	3,191 (96.0)	211 (96.8)	395 (96.6)	1,243 (95.9)	
<i>NI</i>	4,144 (2.4)	3,410 (2.3)	562 (2.6)	113 (3.4)	5 (2.3)	11 (2.7)	43 (3.3)	
<i>NX</i>	907 (0.5)	763 (0.5)	110 (0.5)	19 (0.6)	2 (0.9)	3 (0.7)	10 (0.8)	
SES composite score								< 0.0001
<i>1</i>	33,284 (19.3)	30,032 (20.6)	2,700 (12.3)	190 (5.7)	32 (14.7)	126 (30.8)	204 (15.7)	
<i>2</i>	34,928 (20.2)	31,714 (21.8)	2,611 (11.9)	324 (9.8)	40 (18.3)	80 (19.6)	159 (12.3)	
<i>3</i>	34,913 (20.2)	30,843 (21.2)	3,422 (15.6)	423 (12.7)	19 (8.7)	92 (22.5)	114 (8.8)	
<i>4</i>	43,173 (25.0)	32,949 (22.7)	7,258 (33.0)	1,968 (59.2)	126 (57.8)	87 (21.3)	785 (60.6)	
<i>5</i>	26,389 (15.3)	19,912 (13.7)	6,000 (27.3)	418 (12.6)	1 (0.5)	24 (5.9)	34 (2.6)	
Stage summary								< 0.0001

Variable	All N (%)	Non-Hispanic White N (%)	Non-Hispanic Black N (%)	Mexican N (%)	Cuban N (%)	Puerto Rican N (%)	South/Central American N (%)	p-value
<i>Localized</i>	121,644 (70.4)	102,709 (70.6)	15,426 (70.1)	2,173 (65.4)	152 (69.7)	269 (65.8)	915 (70.6)	
<i>Regional</i>	51,063 (29.6)	42,760 (29.4)	6,566 (29.9)	1,150 (34.6)	66 (30.3)	140 (34.2)	381 (29.4)	
Residence type								< 0.0001
<i>Rural</i>	2,205 (1.3)	2,087 (1.4)	115 (0.5)	3 (0.1)	.	.	.	
<i>Urban</i>	170,482 (98.7)	143,363 (98.6)	21,876 (99.5)	3,320 (99.9)	218 (100)	409 (100)	1,296 (100)	
<i>Unknown</i>	20 (0.0)	19 (0.0)	1 (0.0)	.	.	.	.	
Grade								< 0.0001
<i>Well differentiated</i>	1,262 (0.7)	1,069 (0.7)	127 (0.6)	33 (1.0)	6 (2.8)	7 (1.7)	20 (1.5)	
<i>Moderate differentiated</i>	64,304 (37.2)	54,685 (37.6)	7,537 (34.3)	1,288 (38.8)	92 (42.2)	172 (42.1)	530 (40.9)	
<i>Poorly differentiated</i>	105,376 (61.0)	88,250 (60.7)	14,082 (64.0)	1976 (59.5)	118 (54.1)	223 (54.5)	727 (56.1)	
<i>Undifferentiated</i>	336 (0.2)	273 (0.2)	56 (0.3)	5 (0.2)	1 (0.5)	.	1 (0.1)	
<i>Unknown</i>	1,429 (0.8)	1,192 (0.8)	190 (0.9)	21 (0.6)	1 (0.5)	7 (1.7)	18 (1.4)	

Table 3

Fine-gray competing risks regression analyses for PCSM of radical prostatectomy patients by race and/or ethnicity using Non-Hispanic White cohort as the reference.

<i>Variable</i>	UNIVARIABLE ANALYSES		MULTIVARIABLE ANALYSES ^a	
	HR (95% CI)	<i>p-value</i>	HR (95% CI)	<i>p-value</i>
<i>Non-Hispanic White</i>	1.0 (reference)	–	1.0 (reference)	–
<i>Non-Hispanic Black</i>	1.21	0.036	1.06	0.521
<i>Hispanic/Latino^b</i>	0.98	0.837	0.88	0.207
<i>AAPI</i>	0.77	0.134	0.65	0.006
<i>Non-Hispanic White</i>	1.0 (reference)	–	1.0 (reference)	–
<i>Mexican</i>	1.16	0.425	0.96	0.824
<i>Puerto Rican</i>	2.86	0.002	2.55	0.005
<i>Cuban</i>	1.19	0.808	1.11	0.887
<i>South or Central American</i>	1.33	0.303	1.31	0.339

Abbreviations: HR = hazard ratio; AAPI = Asian American/Pacific Islander HR and p-value were obtained using Fine-Gray competing risks regression model.

^a Multivariable analysis was conducted with competing risks regression analysis adjusting for age at diagnosis, disease stage summary, grade, SES composite score, insurance status, marital status, and residence type.

^b Represents all Hispanic/Latino individuals from the study, including those reported as Hispanic/Latino, NOS.

Table 4

Fine-gray competing risks regression analyses for PCSM of radical prostatectomy patients by race and/or ethnicity using Non-Hispanic Black cohort as the reference.

Variable	UNIVARIABLE ANALYSES		MULTIVARIABLE ANALYSES ^a	
	HR (95% CI)	p-value	HR (95% CI)	p-value
<i>Non-Hispanic Black</i>	1.0 (reference)	–	1.0 (reference)	–
<i>Non-Hispanic White</i>	0.94	0.487	0.95	0.521
<i>Hispanic/Latino^b</i>	0.88	0.311	0.83	0.137
<i>AAPL</i>	0.71	0.045	0.62	0.005
<i>Non-Hispanic Black</i>	1.0 (reference)	–	1.0 (reference)	–
<i>Mexican</i>	1.09	0.656	0.95	0.809
<i>Puerto Rican</i>	2.72	0.004	2.33	0.016
<i>Cuban</i>	1.12	0.879	0.93	0.916
<i>South or Central American</i>	1.26	0.427	1.25	0.462

Abbreviations: HR = hazard ratio; AAPL = Asian American/Pacific Islander HR and p-value were obtained using Fine-Gray competing risks regression model.

^aMultivariable analysis was conducted with competing risks regression analysis adjusting for age at diagnosis, disease stage summary, grade, treatment type, SES composite score, insurance status, marital status, and residence type.

^bRepresents all Hispanic/Latino individuals from the study, including those reported as Hispanic/Latino, NOS.