

Prostate Cancer Disparities in Risk Group at Presentation and Access to Treatment for Asian Americans, Native Hawaiians, and Pacific Islanders: A Study With Disaggregated Ethnic Groups

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QUESTION ASKED: In a disaggregated analysis of men who identified as Asian American, Native Hawaiian, and Pacific Islander (AANHPI) with localized prostate cancer (PCa), what are the (1) differences in PCa risk group at presentation and (2) disparities in access to initial treatment?

SUMMARY ANSWER: Chinese, Japanese, Filipino, Korean, Vietnamese, Laotian, Hmong, Kampuchean, Asian Indian or Pakistani, Native Hawaiians, and Pacific Islander men had greater odds of presenting at a progressively higher localized PCa risk group compared with White patients. Additionally, Japanese Americans were more likely to receive treatment compared with White patients.

WHAT WE DID: We assessed all patients in the National Cancer Database with localized PCa with low-, intermediate-, and high-risk disease who identified as Thai, White, Asian Indian or Pakistani, Asian Indian, Chinese, Vietnamese, Korean, Japanese, Filipino, Hawaiian, Pacific Islander, Laotian, Pakistani, Kampuchean, and Hmong American. Multivariable logistic regression was used to define adjusted odds ratios (AORs) with 95% CI of (1) presenting at progressively higher risk group and (2) receiving treatment for intermediate- or high-risk disease, adjusting for sociodemographic and clinical covariates.

WHAT WE FOUND: All AANHPI subgroups with the exception of Thai, Asian Indian, and Pakistani men had greater odds of presenting at a progressively higher localized PCa risk group compared with White patients (Chinese AOR = 1.18 [95% CI, 1.11 to 1.25], $P < .001$; Japanese AOR = 1.36 [95% CI, 1.26 to 1.47], $P < .001$; Filipino AOR = 1.37 [95% CI, 1.29 to 1.46], $P < .001$; Korean AOR = 1.32 [95% CI, 1.18 to 1.48], $P < .001$; Vietnamese AOR = 1.20 [95% CI, 1.07 to 1.35],

$P = .002$; Laotian AOR = 1.60 [95% CI, 1.08 to 2.36], $P = .018$; Hmong AOR = 4.07 [95% CI, 1.54 to 10.81], $P = .005$; Kampuchean AOR = 1.55 [95% CI, 1.03 to 2.34], $P = .036$; Asian Indian or Pakistani AOR = 1.15 [95% CI, 1.07 to 1.24], $P < .001$; Native Hawaiians AOR = 1.58 [95% CI, 1.38 to 1.80], $P < .001$; and Pacific Islanders AOR = 1.58 [95% CI, 1.37 to 1.82], $P < .001$). Among only AANHPI patients, with Chinese as the referent group, Japanese, Filipino, Hmong, Native Hawaiians, and Pacific Islanders were more likely to present with greater risk disease. Japanese Americans received treatment more frequently upon presentation than White and Chinese American patients.

BIAS, CONFOUNDING FACTOR(S): We could not ascertain the reasons for variation in risk group at presentation or access to treatment, which is an important area for future research. Additionally, our retrospective approach suffers from the potential for selection bias in the patient data captured in the National Cancer Database and does not capture the full complexity of the race or ethnicity groups with which patients identify. Finally, the database only covers the first course of cancer treatment, with no information about subsequent treatments.

REAL-LIFE IMPLICATIONS: Our study uses a disaggregated approach to understand the risk group and treatment disparities in a diverse group of AANHPI men. Our findings suggest that AANHPI men with PCa are more likely to present with higher-risk disease at diagnosis, highlighting the need for further investigation into varying genetic and environmental influences and barriers to care. Furthermore, understanding cultural, sociodemographic, and clinical factors associated with presentation and treatment disparities may promote improved access to care and shared decision making.

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ASSOCIATED CONTENT

Appendix

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abstract

PURPOSE We identified (1) differences in localized prostate cancer (PCa) risk group at presentation and (2) disparities in access to initial treatment for Asian American, Native Hawaiian, and Pacific Islander (AANHPI) men with PCa after controlling for sociodemographic factors.

METHODS We assessed all patients in the National Cancer Database with localized PCa with low-, intermediate-, and high-risk disease who identified as Thai, White, Asian Indian, Chinese, Vietnamese, Korean, Japanese, Filipino, Hawaiian, Pacific Islander, Laotian, Pakistani, Kampuchean, and Hmong. Multivariable logistic regression defined adjusted odds ratios (AORs) with 95% CI of (1) presenting at progressively higher risk group and (2) receiving treatment or active surveillance with intermediate- or high-risk disease, adjusting for sociodemographic and clinical factors.

RESULTS Among 980,889 men (median age 66 years), all AANHPI subgroups with the exception of Thai (AOR = 0.84 [95% CI, 0.58 to 1.21], $P > .05$), Asian Indian (AOR = 1.12 [95% CI, 1.00 to 1.25], $P > .05$), and Pakistani (AOR = 1.34 [95% CI, 0.98 to 1.83], $P > .05$) men had greater odds of presenting at a progressively higher PCa risk group compared with White patients (Chinese AOR = 1.18 [95% CI, 1.11 to 1.25], $P < .001$; Japanese AOR = 1.36 [95% CI, 1.26 to 1.47], $P < .001$; Filipino AOR = 1.37 [95% CI, 1.29 to 1.46], $P < .001$; Korean AOR = 1.32 [95% CI, 1.18 to 1.48], $P < .001$; Vietnamese AOR = 1.20 [95% CI, 1.07 to 1.35], $P = .002$; Laotian AOR = 1.60 [95% CI, 1.08 to 2.36], $P = .018$; Hmong AOR = 4.07 [95% CI, 1.54 to 10.81], $P = .005$; Kampuchean AOR = 1.55 [95% CI, 1.03 to 2.34], $P = .036$; Asian Indian or Pakistani AOR = 1.15 [95% CI, 1.07 to 1.24], $P < .001$; Native Hawaiians AOR = 1.58 [95% CI, 1.38 to 1.80], $P < .001$; and Pacific Islanders AOR = 1.58 [95% CI, 1.37 to 1.82], $P < .001$). Additionally, Japanese Americans (AOR = 1.46 [95% CI, 1.09 to 1.97], $P = .013$) were more likely to receive treatment compared with White patients.

CONCLUSION Our findings suggest that there are differences in PCa risk group at presentation by race or ethnicity among Asian American, Native Hawaiian, and Pacific Islander subgroups and that there exist disparities in treatment patterns. Although AANHPI are often studied as a homogenous group, heterogeneity upon subgroup disaggregation underscores the importance of further study to assess and address barriers to PCa care.

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INTRODUCTION

The American Cancer Society projects approximately 250,000 new cases of prostate cancer (PCa) and more than 30,000 PCa deaths in 2021.¹ Localized PCa accounts for approximately 80% of new diagnoses.² Within localized PCa, risk groups—which categorize disease severity on the basis of clinicopathologic characteristics³—aid treatment and prognostication.

Disparities in diagnosis, treatment, and mortality among men with PCa are extensively studied in the

literature and tend to be associated with socio-demographic and genetic factors.⁴⁻⁷ Of particular importance, race and ethnic group have been shown to influence PCa severity and treatment disparities.⁷⁻⁹ These differences are likely mediated by a complex mix of tumor-specific and societal factors that map with race or ethnicity, including access to care, genomic ancestry, cultural preferences, and systemic barriers to care.⁴⁻⁶ Notably less is known about disparities in the risk group at presentation and subsequent treatment disparities among Asian

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American, Native Hawaiian, and Pacific Islander (AANHPI) men with localized PCa.

AANHPI men in the United States, as well as British Asian men,¹⁰ have a lower incidence of PCa compared with their counterparts of other ethnic groups.² For instance, the incidence of localized PCa in the United States is as follows: AANHPI (aggregated data) at 48.9 men per 100,000, Black or African American at 153.8 men per 100,000, and White American at 94.5 men per 100,000.² However, much of the data on AANHPI men with PCa are presented in aggregate² and therefore mask disparities among different subgroups, as suggested by studies among Asian men in Asia.⁸ In addition, the vast inequities in income and educational attainment among AANHPI groups,¹¹ as well as significant variation in sociocultural beliefs, immigration patterns, lifestyles, health behaviors, and barriers to care,^{12,13} may manifest in PCa disparities across the disease continuum.

Recent events during the COVID-19 pandemic highlight systematic and societal racism toward Asian Americans,¹⁴⁻¹⁶ underscoring existing health disparities that extend well beyond the pandemic.¹⁷ Similarly, Native Hawaiian populations faced racism and violence upon European colonization,^{18,19} with sociodemographic disparities that persist today. Native Hawaiians experience lower income, educational attainment, and access to care, as well as higher rates of diabetes, obesity, and cancer than other racial and ethnic groups,^{19,20} often paralleling the experiences of Pacific Islanders who identified as Native Chamorros, Māori, Kanak, and others.¹⁹ These past and present experiences of systemic and societal racism may create and contribute to disparities that affect AANHPI communities.

Therefore, examining patterns of racial and ethnic disparities in PCa can further elucidate subgroups of AANHPI patients who may benefit from improved access to screening and policies designed to mitigate barriers to care.²¹ Furthermore, with Asian men accounting for 23.3% of new PCa diagnoses worldwide,²² a study of disaggregated ethnicity data would not only elucidate disparities within the United States but also may provide insight into clinical features of these different ethnic groups in the countries to which AANHPI men can trace their ancestry. Using the National Cancer Database (NCDB), the present study aimed to identify differences in PCa risk group at presentation for Asian American, Native Hawaiian, and Pacific Islander men after controlling for sociodemographic factors. We also assessed disparities in access to initial treatment for men with localized PCa.

METHODS

Data Source and Patients

We performed a retrospective cohort analysis of data from 2004 to 2017 using the PCa Participant User File from the NCDB.²³ Established in 1989, the NCDB is a nationwide US hospital-based cancer registry sponsored by the American

Cancer Society and the American College of Surgeons. The NCDB captures approximately 70% of new cancer diagnoses in the United States, and importantly, it allows for disaggregation by Asian American subgroup given the relatively large sample size. We assessed all patients in the NCDB with localized (TxNOMO) prostate adenocarcinoma with low-, intermediate-, and high-risk disease who identified as Thai, White, Asian Indian or Pakistani, Asian Indian, Chinese, Vietnamese, Korean, Japanese, Filipino, Hawaiian, Pacific Islander, Laotian, Pakistani, Kampuchean, and Hmong. Notably, before 2010, South Asian patients who identified as Indian or Pakistani were grouped together. In 2010 and onward, patients who identified as Asian Indian or Pakistani were coded separately.²³ Furthermore, given relatively low sample sizes and consistent with their disaggregation as a distinct ethnogeographic group from Asian Americans in the US Census in 2000, patients who identified as Micronesian, Chamorroan, Guamanian, Polynesian, Tahitian, Samoan, Tongan, Melanesian, Fiji Islander, New Guinean, and Pacific Islander not otherwise specified were grouped together as a single cohort under Pacific Islander, recognizing that these groups represent distinct and unique Pacific Island cultures. Because of a relatively larger cohort size, patients who identified as Hawaiian were considered separately.

Men were categorized as having low- (Gleason \leq 6, prostate-specific antigen [PSA] $<$ 10 ng/mL, and cT1-T2a), intermediate- (Gleason 7, PSA 10-20 ng/mL, or cT2b-T2c), or high-risk disease (Gleason 8-10, PSA $>$ 20 ng/mL, or cT3-T4) on the basis of AUA/ASTRO guidelines^{24,25} and consistent with previous studies.²⁶ We excluded patients for whom there were incomplete data for the assignment of risk groups.

Clinical and Sociodemographic Covariates

The primary dependent variables of interest were TxNOMO PCa risk group upon presentation and status of treatment by a provider (no treatment given, active surveillance or watchful waiting, or treatment given). Lack of treatment is coded in the NCDB as “Treatment is refused or the physician decides not to treat for any reason such as the presence of comorbidities.” Additionally, treatment after a period of active surveillance is considered subsequent treatment and is not encoded as active surveillance or watchful waiting.²³

The primary independent variables of interest were race or ethnicity (Vietnamese, Korean, Thai, White, Asian Indian or Pakistani, Asian Indian, Chinese, Japanese, Filipino, Native Hawaiian, Pacific Islander, Laotian, Pakistani, Kampuchean, and Hmong), age, facility type, median household income for each patient’s ZIP code ($<$ \$38,000 in US dollars [USD], \$38,000-\$47,999 USD, \$48,000-\$62,999 USD, or \geq \$63,000 USD), percentage of adults in the patient’s ZIP code who did not graduate from high school (\geq 21.0%, 13.0%-20.9%, 7.0%-12.9%, or $<$ 7.0%),

Charlson-Deyo comorbidity coefficient (0, 1, 2, or ≥ 3), insurance status (uninsured, private insurance or managed care, Medicaid, Medicare, other government, or unknown), and year of diagnosis. Data on income and percentage of high-school graduates and proxies for socioeconomic status made use of quartiles that were derived from the 2012 *American Community Survey* for each patient's home ZIP code (Table 1).

Statistical Analysis

The statistical analyses carried out in this study involved ordinal logistic regressions to compare the effects of categorical and quantitative independent variables on ordinal dependent variables. Ordinal logistic regression models defined adjusted odds ratios (AOR) with 95% CI of (1) presenting in a progressively higher TxNOMO PCa risk group, adjusting for all independent variables listed above, and (2) receiving treatment or active surveillance with intermediate- or high-risk disease, adjusting for all independent variables listed above and risk group.⁷ Such a regression model implicitly assumes that the difference between low- and intermediate-risk diseases is equivalent to that between intermediate- and high-risk diseases and that the difference between no treatment and active surveillance is equivalent to that between active surveillance and treatment. For both primary dependent variables, separate models defined AORs with 95% CIs, initially with White patients as the referent group given that they represent the largest race or ethnicity group in the NCDB; subsequently, analyses were conducted in which White patients were excluded from the regression to allow for comparison between Asian American subgroups, Native Hawaiians, and Pacific Islanders, with Chinese Americans as the referent given the sample size. Additionally, supplemental analyses for both primary dependent variables were conducted to retrieve odds ratios (ORs), only adjusting for race or ethnicity, age, and risk group to allow for the maximum possible patients despite disaggregation by race or ethnicity. Analyses were performed using Stata/SE 16.1 (StataCorp, College Station, TX). The hospital institutional review board deemed the study to be exempt given the use of deidentified data.

RESULTS

Baseline Characteristics

Of 980,889 men included in the study, the median age was 66 (interquartile range: 60-72) years; 244,755 (24.95%) had low-risk disease, 491,181 (50.08%) had intermediate-risk disease, and 244,953 (24.97%) had high-risk disease. White Americans made up 98.16% ($n = 962,798$), Chinese 0.40% ($n = 3,880$), Japanese 0.25% ($n = 2,437$), Filipino 0.40% ($n = 3,891$), Hawaiian 0.08% ($n = 802$), Korean 0.11% ($n = 1,087$), Vietnamese 0.11% ($n = 1,105$), Laotian 0.01% ($n = 96$), Hmong < 0.01% ($n = 18$), Kampuchean 0.01% ($n = 87$), Thai 0.01%

($n = 106$), Asian Indian or Pakistani 0.27% ($n = 2,600$), Asian Indian 0.12% ($n = 1,132$), Pakistani 0.02% ($n = 149$), and Pacific Islander 0.07% ($n = 701$; Appendix Table A1, online only). In the study cohort, 28,297 men (2.89%) had no insurance or were on Medicaid (Table 1).

Disparities in Risk Group at Presentation

Ordinal logistic regression modeling indicated that, with the exception of Thai (AOR = 0.84; 95% CI, 0.58 to 1.21; $P > .05$), Asian Indian (AOR = 1.12; 95% CI, 1.00 to 1.25; $P > .05$), and Pakistani (AOR = 1.34; 95% CI, 0.98 to 1.83; $P > .05$) men, all AANHPI subgroups had greater odds of presenting at a progressively higher TxNOMO PCa risk group compared with White patients (Fig 1 and Table 2; Chinese AOR = 1.18, 95% CI, 1.11 to 1.25, $P < .001$; Japanese AOR = 1.36, 95% CI, 1.26 to 1.47, $P < .001$; Filipino AOR = 1.37, 95% CI, 1.29 to 1.46, $P < .001$; Korean AOR = 1.32, 95% CI, 1.18 to 1.48, $P < .001$; Vietnamese AOR = 1.20, 95% CI, 1.07 to 1.35, $P = .002$; Laotian AOR = 1.60, 95% CI, 1.08 to 2.36, $P = .018$; Hmong AOR = 4.07, 95% CI, 1.54 to 10.81, $P = .005$; Kampuchean AOR = 1.55, 95% CI, 1.03 to 2.34, $P = .036$; Asian Indian or Pakistani AOR = 1.15, 95% CI, 1.07 to 1.24, $P < .001$; Native Hawaiians AOR = 1.58, 95% CI, 1.38 to 1.80, $P < .001$; and Pacific Islanders AOR = 1.58, 95% CI, 1.37 to 1.82, $P < .001$). ORs from analyses adjusting for race or ethnicity and age only demonstrated similar racial and ethnic disparities in risk group at presentation, with Asian Indian and Pakistani Americans becoming significantly more likely to present at a progressively higher risk group than White patients (Asian Indian OR = 1.48, 95% CI, 1.32 to 1.65, $P < .001$; Pakistani OR = 2.03, 95% CI, 1.50 to 2.76, $P < .001$; Appendix Table A2, online only).

On subgroup analysis including only AANHPI patients, with Chinese as the referent group, Japanese (AOR = 1.15; 95% CI, 1.04 to 1.27; $P = .005$), Filipino (AOR = 1.18; 95% CI, 1.08 to 1.28; $P < .001$), Hmong (AOR = 3.45; 95% CI, 1.30 to 9.17; $P = .013$), Native Hawaiians (AOR = 1.37; 95% CI, 1.19 to 1.59; $P < .001$), and Pacific Islanders (AOR = 1.38; 95% CI, 1.18 to 1.61; $P < .001$) were more likely to present with greater risk disease (Appendix Table A4, online only).

Disparities in Treatment

Ordinal logistic regression modeling defined AORs for receiving treatment or active surveillance with intermediate- or high-risk disease, with White patients as the comparison group (AOR > 1 indicates greater odds of receiving treatment; AOR < 1 indicates lower odds of receiving treatment), and found that Japanese Americans were more likely to receive treatment compared with White patients (Japanese AOR = 1.46; 95% CI, 1.09 to 1.97; $P = .013$; Table 3). Hmong Americans were nominally more likely to receive treatment (Hmong AOR undefined, 0 no treatment, 0 active surveillance, and 12 treatment given).

TABLE 1. Baseline Cohort Characteristics

Clinical or Sociodemographic Covariate	Raw No. (raw %)
Total cohort	980,889
Race	
White	962,798 (98.16)
Chinese	3,880 (0.40)
Japanese	2,437 (0.25)
Filipino	3,891 (0.40)
Native Hawaiian	802 (0.08)
Korean	1,087 (0.11)
Vietnamese	1,105 (0.11)
Laotian	96 (0.01)
Hmong	18 (< 0.01)
Kampuchean	87 (0.01)
Thai	106 (0.01)
Asian Indian or Pakistani	2,600 (0.27)
Asian Indian	1,132 (0.12)
Pakistani	149 (0.02)
Pacific Islander	701 (0.07)
Age, years	
18-39	0 (0)
40-64	440,174 (44.88)
≥ 65	540,715 (55.12)
Median (IQR)	66 (60-72)
Risk group	
Low risk	244,755 (24.95)
Intermediate risk	491,181 (50.08)
High risk	244,953 (24.97)
Facility type	
Community cancer program	77,117 (7.86)
Comprehensive community cancer program	422,175 (43.04)
Academic or research program	359,896 (36.69)
Integrated network cancer program	121,701 (12.41)
Zip code-wide median household income	
< \$40,227 USD	117,515 (11.98)
\$40,227-\$50,353 USD	214,684 (21.89)
\$50,354-\$63,332 USD	271,449 (27.67)
≥ \$63,333 USD	377,241 (38.46)
Zip code-wide percent without high school education	
< 7.0	305,266 (31.12)
7.0-12.9	341,265 (34.79)
13.0-20.9	216,602 (22.08)
≥ 21.0	117,756 (12.01)
Charlson-Deyo comorbidity score	
0	821,754 (83.78)

(continued in next column)

TABLE 1. Baseline Cohort Characteristics (continued)

Clinical or Sociodemographic Covariate	Raw No. (raw %)
1	128,418 (13.09)
2	22,839 (2.33)
≥ 3	7,878 (0.80)
Insurance	
Uninsured	11,468 (1.17)
Private insurance or managed care	458,748 (46.77)
Medicaid	16,829 (1.72)
Medicare	462,713 (47.17)
Other government	16,608 (1.69)
Unknown	14,523 (1.48)
Year of diagnosis	
2004	70,399 (7.18)
2005	72,879 (7.43)
2006	82,022 (8.36)
2007	87,764 (8.95)
2008	83,081 (8.47)
2009	71,858 (7.33)
2010	73,237 (7.47)
2011	76,419 (7.79)
2012	62,402 (6.36)
2013	60,852 (6.20)
2014	57,440 (5.86)
2015	62,773 (6.40)
2016	58,318 (5.95)
2017	61,445 (6.26)

Abbreviation: IQR, interquartile range.

There was no statistically significant difference between the rate of treatment receipt between the other ethnic subgroups and their White counterparts. However, there was a trend suggesting that many of these ethnic groups were less likely to receive treatment, particularly among the Southeast Asian communities, i.e., Thai, Laotian, and Kampuchean (Fig 2 and Table 3; all *P* values > .05; Chinese AOR = 0.91, 95% CI, 0.76 to 1.10; Filipino AOR = 0.97, 95% CI, 0.79 to 1.19; Korean AOR = 1.07, 95% CI, 0.74 to 1.55; Vietnamese AOR = 0.76, 95% CI, 0.55 to 1.05; Laotian AOR = 0.75, 95% CI, 0.26 to 2.11; Kampuchean AOR = 0.54, 95% CI, 0.19 to 1.54; Thai AOR = 0.74, 95% CI, 0.26 to 2.10; Asian Indian or Pakistani AOR = 0.85, 95% CI, 0.65 to 1.09; Asian Indian AOR = 1.03, 95% CI, 0.78 to 1.36; Pakistani AOR = 1.68, 95% CI, 0.68 to 4.16; Native Hawaiians AOR = 1.46, 95% CI, 0.87 to 2.45; and Pacific Islanders AOR = 1.15, 95% CI, 0.69 to 1.91). ORs from analyses adjusting for race or ethnicity, age, and risk group only demonstrated similar racial and ethnic disparities for receiving treatment or active surveillance, with Chinese and Vietnamese Americans becoming significantly

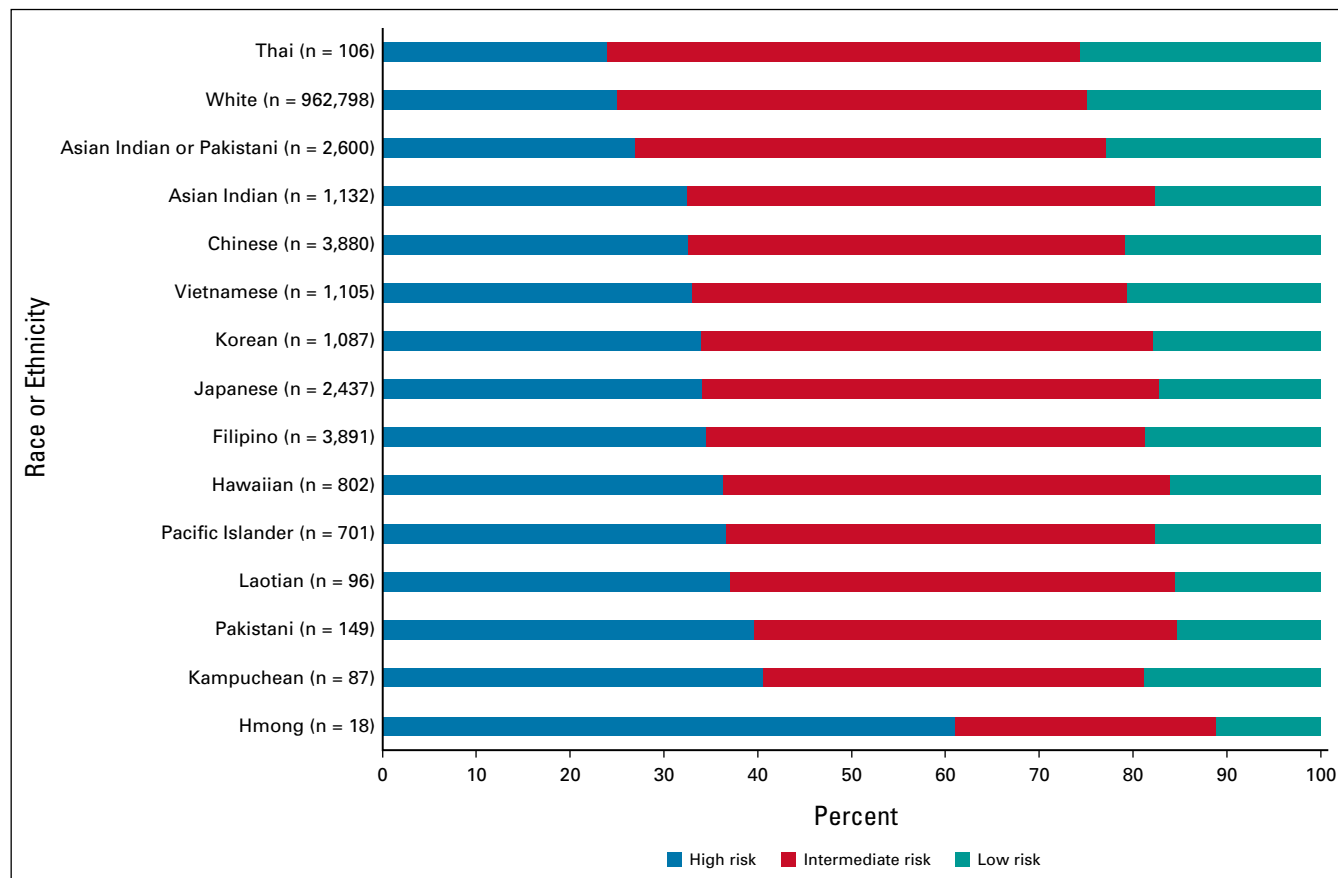


FIG 1. Proportion of men with low-, intermediate-, and high-risk prostate cancer at presentation, stratified by race or ethnicity.

less likely to receive treatment than White patients (Chinese OR = 0.82, 95% CI, 0.68 to 0.99, $P = .043$; Vietnamese OR = 0.69, 95% CI, 0.50 to 0.95, $P = .025$; Appendix Table A3, online only).

On subgroup analysis including only AANHPI patients, with Chinese as the referent group, Japanese Americans (AOR = 1.69; 95% CI, 1.17 to 2.42; $P = .005$) received active surveillance or treatment more frequently upon presentation (Appendix Table A5, online only).

DISCUSSION

In this study of 980,889 US men diagnosed with prostate adenocarcinoma from 2004 to 2017, we found that Chinese, Japanese, Filipino, Korean, Vietnamese, Laotian, Hmong, Kampuchean, Asian Indian or Pakistani, Native Hawaiian, and Pacific Islander race or ethnicity groups were associated with increased odds of presenting at a progressively higher TxNOMO PCa risk group compared with White patients. These findings underscore that, although the incidence of PCa may be lower among AANHPI men compared with White and Black men on average,⁸ AANHPI men with PCa may be more likely to present with higher-risk disease at diagnosis. Despite these trends of

worse risk group on presentation, several racial and ethnic groups were associated with lower odds of receiving treatment or active surveillance compared with White patients, although these results were not statistically significant. In a secondary analysis, we found that Japanese, Filipino, Hmong, Native Hawaiian, and Pacific Islander race or ethnicity were associated with increased odds of higher risk localized PCa compared with Chinese patients.

These results corroborate other studies suggesting that there are differences in rates of high-risk PCa by race or ethnicity among Asian American subgroups. Some studies suggest a role of genetic ancestry in predisposing Asian American men toward high-risk PCa, such as differential prevalence of ERG oncoprotein, low rate of PTEN loss, high *CHD1* enrichment, *FOXA1* alterations, and deletions in *ZNF292* and *CHD1*.^{27,28} However, it is likely that socio-demographic factors play a role as well, such as variable accessibility to PSA testing and urology clinics, paired with environmental influences such as diet.⁸ For example, McCracken et al²⁹ suggest that the finding that Filipino men are at higher risk of PCa incidence compared with other Asian American men may be due in part to dietary risk. The interaction between genetic ancestry and sociodemographic factors is complex and requires further investigation.

TABLE 2. AORs and 95% CIs Comparing the Odds of Presenting at Progressively Higher Risk Group on the Basis of Race or Ethnicity, Age, Facility Type, Median Household Income for Each Patient’s Area of Residence, Percentage of Adults in the Patient’s Zip Code Who Did Not Graduate From High School, Charlson-Deyo Comorbidity Coefficient, and Insurance Status

Clinical or Sociodemographic Covariate	AOR	95% CI	P
Race			
White	Ref	—	NA
Chinese	1.18	1.11 to 1.25	< .001
Japanese	1.36	1.26 to 1.47	< .001
Filipino	1.37	1.29 to 1.46	< .001
Native Hawaiian	1.58	1.38 to 1.80	< .001
Korean	1.32	1.18 to 1.48	< .001
Vietnamese	1.20	1.07 to 1.35	.002
Laotian	1.60	1.08 to 2.36	.018
Hmong	4.07	1.54 to 10.81	.005
Kampuchean	1.55	1.03 to 2.34	.036
Thai	0.84	0.58 to 1.21	.344
Asian Indian or Pakistani	1.15	1.07 to 1.24	< .001
Asian Indian	1.12	1.00 to 1.25	.054
Pakistani	1.34	0.98 to 1.83	.063
Pacific Islander	1.58	1.37 to 1.82	< .001
Age			
Age (continuous)	1.05	1.05 to 1.05	< .001
Facility type			
Community cancer program	Ref	—	NA
Comprehensive community cancer program	0.92	0.91 to 0.94	< .001
Academic or research program	0.89	0.87 to 0.90	< .001
Integrated network cancer program	0.93	0.92 to 0.95	< .001
Zip code–wide median household income			
< \$40,227 USD	Ref	—	NA
\$40,227–\$50,353 USD	0.99	0.98 to 1.01	.217
\$50,354–\$63,332 USD	0.98	0.96 to 0.99	.005
≥ \$63,333 USD	0.95	0.93 to 0.96	< .001
Zip code–wide percent without high school education			
< 7.0	0.90	0.88 to 0.91	< .001
7.0–12.9	0.93	0.92 to 0.94	< .001
13.0–20.9	0.96	0.94 to 0.97	< .001
≥ 21.0	Ref	—	NA
Charlson-Deyo comorbidity score			
0	Ref	—	NA
1	1.14	1.12 to 1.15	< .001
2	1.30	1.26 to 1.33	< .001
≥ 3	1.39	1.34 to 1.46	< .001

(continued in next column)

TABLE 2. AORs and 95% CIs Comparing the Odds of Presenting at Progressively Higher Risk Group on the Basis of Race or Ethnicity, Age, Facility Type, Median Household Income for Each Patient’s Area of Residence, Percentage of Adults in the Patient’s Zip Code Who Did Not Graduate From High School, Charlson-Deyo Comorbidity Coefficient, and Insurance Status (continued)

Clinical or Sociodemographic Covariate	AOR	95% CI	P
Insurance			
Uninsured	Ref	—	NA
Private insurance or managed care	0.60	0.58 to 0.62	< .001
Medicaid	0.92	0.87 to 0.96	< .001
Medicare	0.57	0.55 to 0.59	< .001
Other government	0.66	0.63 to 0.70	< .001
Unknown	0.63	0.60 to 0.66	< .001
Year of diagnosis			
2004	Ref	—	NA
2005	0.96	0.94 to 0.98	< .001
2006	0.96	0.94 to 0.98	< .001
2007	0.98	0.96 to 1.00	.039
2008	1.04	1.02 to 1.06	< .001
2009	1.14	1.11 to 1.16	< .001
2010	0.96	0.94 to 0.97	< .001
2011	0.97	0.96 to 0.99	.010
2012	1.14	1.12 to 1.17	< .001
2013	1.26	1.23 to 1.28	< .001
2014	1.40	1.37 to 1.43	< .001
2015	1.46	1.43 to 1.49	< .001
2016	3.50	3.43 to 3.58	< .001
2017	3.45	3.38 to 3.52	< .001

Abbreviations: AORs, adjusted odds ratios; NA, not available; ref, reference.

These disparities suggest the need to further personalize screening and treatment regimens in ways that may take into consideration race and ethnicity, as well as socio-demographic factors associated with AANHPI subgroups.

In addition to these established disaggregated Asian American subgroup disparities, Native Hawaiian and Pacific Islander race or ethnicity was associated with worse localized PCa risk group than White patients. Native Hawaiians and Pacific Islanders in the United States, including Samoans, Chamorros, Fijians, Palauans, and Tongans, experience complex cancer disparities and suffer from disproportionately high cancer morbidity and mortality.³⁰ These disparities are likely due to poor social determinants of health and access to preventive services; low rates of routine cancer screening and financial toxicity post-treatment persist in the Native Hawaiian and Pacific Islander populations.³¹⁻³⁴ Although our study aggregates

Pacific Islanders, it is important to recognize the considerable heterogeneity inherent to these groups; there are more than 39 different Pacific Island languages spoken as a second language in the United States alone and more than 1,300 languages across Melanesia, Micronesia, and Polynesia.^{35,36} More work is needed to characterize and address the specific needs of these groups.

Considering this context, the role of barriers to PCa care in Asian Americans, Native Hawaiians, and Pacific Islanders merits further exploration. Asian Americans are generally studied as a homogenous group that is physically healthier and economically more successful than White patients in the literature, but significant within-group differences and unique health care needs exist between the several ethnic groups comprising Asian Americans.³⁷ Although subgroups such as Laotian, Hmong, and Kampuchean patients, who are more likely to be of lower socioeconomic status than other AANHPI groups,¹¹ have small sample sizes ($n < 100$) in the NCDB over a 14-year period, these groups are nonetheless associated with high rates of high-risk PCa at presentation. Despite presenting with higher risk PCa, the current study highlights that Laotian, Hmong, and Kampuchean patients were not more likely to receive treatment than White patients.

Barriers in access to care, such as language, health literacy, and socioeconomic differences, may explain these phenomena. At 35%, Asian Americans and Hispanic Americans exhibit the highest rates of limited English proficiency; however, disaggregated statistics indicate that rates of disfluency are significantly higher for specific groups, such as Vietnamese (53%), Chinese (46%), Korean (45%), Thai (45%), Kampuchean (44%), Bangladeshi (43%), Laotian (42%), and Hmong (41%) Americans.³⁸ Many of these groups exhibit linguistic isolation as well, in which no member of a given household is proficient in English. As a result, Asian American patients report obstacles in scheduling doctor appointments, locating health clinics, communicating with health care providers, and obtaining knowledge about medical conditions because of lack of proficiency in English. Additionally, patients may feel hesitant when using interpreter services or asking questions regarding their health, potentially because of fear that confidentiality will be breached within the broader Asian American community.^{37,39,40} A direct consequence of these language barriers is deficits in health literacy, which entails the ability to understand health literature and use analytic decision-making skills in health care settings. Health literacy deficits have the effect of limiting the care that patients would otherwise receive, and certain cultural beliefs regarding disease may be associated with worse health outcomes. Such literacy deficits are particularly exacerbated in elderly Asian American populations, who may neglect preventative medicine and seek care when symptoms are severe enough; for example, one study found that in women age 65 years or older,

14.8% of Korean immigrants had heard of mammography screenings, compared with 40.9% of Whites.⁴¹ Likewise, another study found that lifetime rates of cancer screening among Chicago-area older Chinese Americans were low and higher health literacy correlated with an increased likelihood of cancer screening in this cohort.⁴² With regard to socioeconomic differences, Asian Americans exhibit considerable variation across subgroups. For instance, rates of non-insurance were low among Japanese (7%), South Asian (11%), Filipino (11%), and Chinese (15%) Americans, and high amongst Vietnamese (21%) and Korean (36%) Americans.⁴³ Moreover, only 55% of Vietnamese Americans have completed some college or above, compared with 73% of all Asian Americans.⁴⁴ On the basis of these examples, language, literacy, and socioeconomic barriers may also influence Asian Americans in seeking prostate care treatment at a more advanced stage than White patients, further complicating the role of genetics and environment in racial disparities. Given these and other barriers to care among Asian Americans, it is important to address these in culturally sensitive and culturally aware ways rather than assuming that the underlying causes are biologic, given the close association between sustained inequitable access to resources and poor social determinants.⁴⁵

Indeed, barriers to treatment by race are reflected in cancer treatment uptake and outcomes in the literature. Dee et al found that, for example, Black and Asian patients are more likely to refuse or choose to not complete potentially survival-prolonging locoregional treatment, such as radiotherapy and surgery, for localized prostate adenocarcinoma despite provider recommendation.^{26,46} Alty et al⁴⁷ similarly showed that Black patients are more likely to refuse surgery for colon cancer and greater refusal correlates with worse overall survival. Although there was no statistically significant difference in treatment uptake for most subgroups, the findings in the present study are slightly more complex because of the disaggregation of Asian Americans, as Chinese, Filipino, Korean, Vietnamese, Laotian, Kampuchean, Asian Indian or Pakistani, and Asian Indian patients received treatment less frequently on average than White patients (with a subset of these having significant ORs). However, Japanese, Pakistani, Native Hawaiian, and Pacific Islander patients received treatment more frequently on average than White patients. This split in treatment uptake by subgroup likely has complex underpinnings and may reflect differential barriers to care and data availability in the NCDB.

In future studies, it will be critical to separate out the role of genetic variants by race or ethnicity with sociodemographic factors that affect stage of presentation and access to treatment for PCa. For example, one factor that may elucidate these differences upon further investigation is screening rate of PCa by race or ethnicity during primary care appointments. This is motivated by data that suggest that many Asian countries may have lower incidences of PCa, but screening for PCa across the continent has been

TABLE 3. AORs and 95% CIs Comparing the Odds of Receiving Treatment or Active Surveillance on the Basis of Race or Ethnicity, Age, Risk Group, Facility Type, Median Household Income for Each Patient’s Area of Residence, Percentage of Adults in the Patient’s Zip Code Who Did Not Graduate From High School, Charlson-Deyo Comorbidity Coefficient, and Insurance Status

Clinical or Sociodemographic Covariate	AOR	95% CI	P
Race			
White	Ref	—	NA
Chinese	0.91	0.76 to 1.10	.344
Japanese	1.46	1.09 to 1.97	.013
Filipino	0.97	0.79 to 1.19	.768
Native Hawaiian	1.46	0.87 to 2.45	.154
Korean	1.07	0.74 to 1.55	.718
Vietnamese	0.76	0.55 to 1.05	.099
Laotian	0.75	0.26 to 2.11	.580
Hmong	—	—	—
Kampuchean	0.54	0.19 to 1.54	.251
Thai	0.74	0.26 to 2.10	.576
Asian Indian or Pakistani	0.85	0.65 to 1.09	.202
Asian Indian	1.03	0.78 to 1.36	.824
Pakistani	1.68	0.68 to 4.16	.262
Pacific Islander	1.15	0.69 to 1.91	.590
Age			
Age (continuous)	0.95	0.94 to 0.95	< .001
Risk group			
Intermediate risk	Ref	—	NA
High risk	1.84	1.78 to 1.90	< .001
Facility type			
Community cancer program	Ref	—	NA
Comprehensive community cancer program	1.43	1.37 to 1.50	< .001
Academic or research program	1.05	1.00 to 1.10	.063
Integrated network cancer program	1.58	1.49 to 1.68	< .001
Zip code-wide median household income			
< \$40,227 USD	Ref	—	NA
\$40,227-\$50,353 USD	1.14	1.09 to 1.20	< .001
\$50,354-\$63,332 USD	1.17	1.11 to 1.23	< .001
≥ \$63,333 USD	1.25	1.18 to 1.32	< .001
Zip code-wide percent without high school education			
< 7.0	1.05	0.99 to 1.11	.093
7.0-12.9	1.06	1.01 to 1.12	.019
13.0-20.9	1.07	1.02 to 1.12	.007
≥ 21.0	Ref	—	NA

(continued in next column)

TABLE 3. AORs and 95% CIs Comparing the Odds of Receiving Treatment or Active Surveillance on the Basis of Race or Ethnicity, Age, Risk Group, Facility Type, Median Household Income for Each Patient’s Area of Residence, Percentage of Adults in the Patient’s Zip Code Who Did Not Graduate From High School, Charlson-Deyo Comorbidity Coefficient, and Insurance Status (continued)

Clinical or Sociodemographic Covariate	AOR	95% CI	P
Charlson-Deyo comorbidity score			
0	Ref	—	NA
1	1.30	1.24 to 1.35	< .001
2	1.16	1.07 to 1.26	< .001
≥ 3	0.92	0.83 to 1.03	.142
Insurance			
Uninsured	Ref	—	NA
Private insurance or managed care	2.42	2.20 to 2.66	< .001
Medicaid	1.68	1.48 to 1.90	< .001
Medicare	2.72	2.47 to 2.99	< .001
Other government	3.96	3.41 to 4.58	< .001
Unknown	2.14	1.86 to 2.47	< .001
Year of diagnosis			
2010	Ref	—	NA
2011	0.88	0.82 to 0.93	< .001
2012	0.77	0.73 to 0.82	< .001
2013	0.64	0.60 to 0.68	< .001
2014	0.67	0.63 to 0.72	< .001
2015	0.60	0.57 to 0.64	< .001
2016	0.57	0.54 to 0.60	< .001
2017	0.52	0.50 to 0.55	< .001

Abbreviations: AOR, adjusted odds ratios; NA, not available; ref, reference.

rapidly rising over the past two decades.⁴⁸ Although some evidence indicates that Asian men display lower rates of PCa diagnosis in a controlled setting with equal rates of PSA-independent biopsies as White men over a four-year time period,⁴⁹ longer-term studies are required to fully understand the relationship between screening and diagnosis. Indeed, studies from the United States offer conflicting results. On the one hand, Asian Americans have reported PSA screening less frequently than White men in California and there is an association between Asian and Pacific Islander race or ethnicity and higher PSA at diagnosis in the NCDB.^{50,51} Earlier studies revealed that, consistent with decreased screening behavior, Asian Americans were more likely than Whites to be diagnosed at a more advanced stage.⁵²⁻⁵⁴ However, more recent studies have concluded that Asian Americans were more likely to present at an earlier stage of disease than Whites, consistent with findings from another study on a population

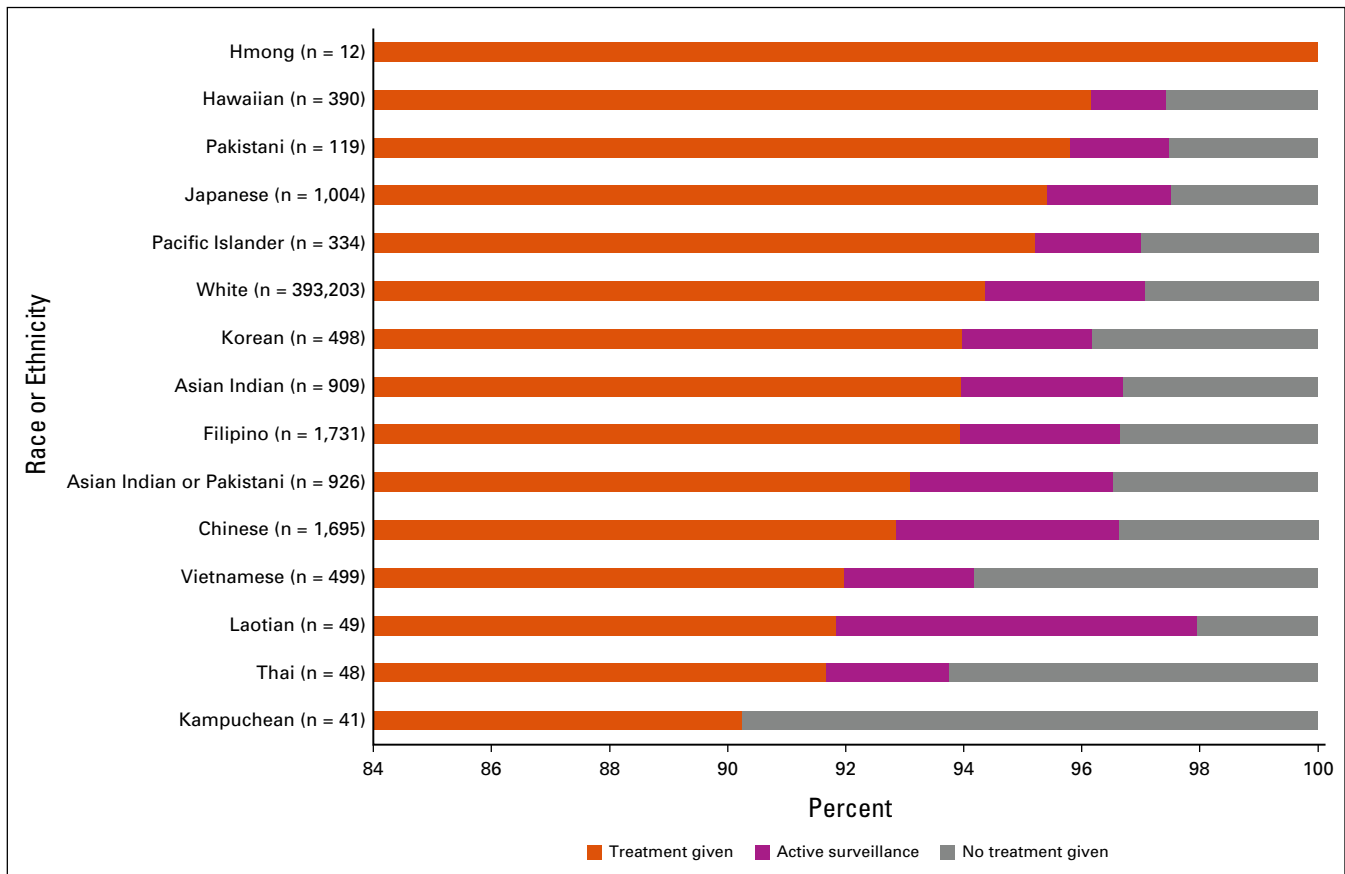


FIG 2. Proportion of men with prostate cancer given treatment, active surveillance, and no treatment, stratified by race or ethnicity.

with mandatory PSA screening.^{51,55} Regardless, the higher association between Gleason score and Asian American race or ethnicity reported in recent studies is unlikely to be driven solely by screening behavior, since higher Gleason score has not been explicitly linked with timing of diagnosis.^{52,53,56} Finally, qualitative assessment is important to probe the reasons that different Asian American subgroups have for not receiving or pursuing treatment, despite tending to present at higher risk group of PCa.

Our study must be viewed in terms of its limitations. First, we could not completely ascertain the reasons for disparate risk group at presentation or access to treatment, which will be an important area for future qualitative studies. Second, our retrospective approach suffers from lack of quality control in data collection and potential for selection bias in the choice of patients represented by the NCDB and therefore carries the risk of misclassification. There are also other limitations within the NCDB data set—for instance, the database only covers the first course of cancer treatment, with no information about subsequent treatments. Confounders not included in the data set may partially explain the identified disparities. However, the NCDB is one of the largest available data sources on Asian Americans and PCa, underscoring the need for greater representation of minority racial and ethnic groups in data sources. Third,

the use of discrete race and ethnic groups likely misses the nuances of cultural factors that may influence disparities; for example, the database does not specifically include patients who identified with multiple AANHPI identities and provides no information on cultural preferences other than the name of the group with which people identify. Additionally, our approach involved aggregating Pacific Islanders because of sample size, despite the considerable heterogeneity among the many diverse Pacific Islander cultures.^{35,36} Furthermore, groups such as Burmese and Malay are not included in the NCDB, limiting our understanding of the disparities affecting these populations. Therefore, our findings are hypothesis-generating and should be used to guide the study of disparities in patient- and provider-level biases in PCa care, as well as efforts to address and mitigate these disparities.

In conclusion, consistent with recommendations from cancer epidemiologists and oncology providers, our study uses a disaggregated approach to understand the risk group and treatment disparities in the vast spectrum of AANHPI men.¹⁷ Disparities exist in localized PCa risk group upon presentation and access to treatment in Thai, Asian Indian or Pakistani, Chinese, Vietnamese, Korean, Japanese, Filipino, Hawaiian, Pacific Islander, Laotian, Kampuchean, and Hmong men relative to White men,

highlighting the need for further investigation into varying genetic and environmental influences, as well as barriers to care differentially affecting Asian American men with PCa. Assessing and addressing reasons for these disparities may help mitigate disparities by ensuring that all

individuals have access to treatment. Furthermore, understanding cultural, sociodemographic, and clinical factors associated with presentation and treatment disparities may promote improved and shared decision making.

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AUTHORS' DISCLOSURES OF POTENTIAL CONFLICTS OF INTEREST

Prostate Cancer Disparities in Risk Group at Presentation and Access to Treatment for Asian Americans, Native Hawaiians, and Pacific Islanders: A Study With Disaggregated Ethnic Groups

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APPENDIX

TABLE A1. Disaggregated Asian American, Native Hawaiian, and Pacific Islander Subgroups and Regions of Origin

Indian Subcontinent	East Asia	South East Asia	Pacific Islanders
2004-2009 Asian Indian or Pakistani (n = 2,600)	Chinese (n = 3,880)	Filipino (n = 3,891)	Pacific Islander, NOS (n = 392)
	Japanese (n = 2,437)	Vietnamese (n = 1,105)	Native Hawaiian (n = 802)
2010-present Asian Indian (n = 1,132) Pakistani (n = 149)	Korean (n = 1,087)	Laotian (n = 96)	Micronesian (n = 38)
		Hmong (n = 18)	Chamorrans (n = 6)
		Kampuchean (n = 87)	Guamanian (n = 41)
		Thai (n = 106)	Polynesian (n = 19)
			Tahitian (n = 6)
			Samoan (n = 142)
			Tongan (n = 22)
			Melanesian (n = 6)
			Fiji Islander (n = 21)
			New Guinean (n = 8)

Abbreviation: NOS, not otherwise specified.

TABLE A2. ORs and 95% CIs Comparing the Odds of Presenting at Progressively Higher Risk Group on the Basis of Race or Ethnicity and Age

Clinical or Sociodemographic Covariate	OR	95% CI	P
Race			
White	Ref	—	NA
Chinese	1.21	1.14 to 1.29	< .001
Japanese	1.29	1.20 to 1.40	< .001
Filipino	1.42	1.34 to 1.51	< .001
Native Hawaiian	1.62	1.42 to 1.84	< .001
Korean	1.31	1.17 to 1.47	< .001
Vietnamese	1.30	1.17 to 1.46	< .001
Laotian	1.80	1.23 to 2.64	.003
Hmong	3.81	1.46 to 9.98	.006
Kampuchean	1.82	1.21 to 2.73	.004
Thai	0.96	0.67 to 1.38	.812
Asian Indian or Pakistani	1.15	1.07 to 1.24	< .001
Asian Indian	1.48	1.32 to 1.65	< .001
Pakistani	2.03	1.50 to 2.76	< .001
Pacific Islander	1.69	1.46 to 1.94	< .001
Age			
Age (continuous)	1.05	1.05 to 1.05	< .001

Abbreviations: OR, odds ratio; NA, not available; ref, reference.

TABLE A3. ORs and 95% CIs Comparing the Odds of Receiving Treatment or Active Surveillance on the Basis of Race or Ethnicity, Age, and Risk Group

Clinical or Sociodemographic Covariate	OR	95% CI	P
Race			
White	Ref	—	NA
Chinese	0.82	0.68 to 0.99	.043
Japanese	1.41	1.05 to 1.90	.024
Filipino	0.92	0.76 to 1.13	.436
Native Hawaiian	1.40	0.83 to 2.35	.205
Korean	1.00	0.69 to 1.45	.996
Vietnamese	0.69	0.50 to 0.95	.025
Laotian	0.70	0.25 to 1.97	.499
Hmong	—	—	—
Kampuchean	0.46	0.16 to 1.31	.146
Thai	0.65	0.23 to 1.83	.415
Asian Indian or Pakistani	0.78	0.61 to 1.01	.059
Asian Indian	0.92	0.70 to 1.21	.55
Pakistani	1.28	0.52 to 3.15	.59
Pacific Islander	1.09	0.66 to 1.80	.739
Age			
Age (continuous)	0.95	0.95 to 0.95	< .001
Risk group			
Intermediate risk	Ref	—	NA
High risk	1.75	1.70 to 1.81	< .001

Abbreviations: OR, odds ratio; NA, not available; ref, reference.

TABLE A4. AORs and 95% CIs for Asian American, Native Hawaiian, and Pacific Islander Patients Only Comparing the Odds of Presenting at Progressively Higher Risk Group on the Basis of Race or Ethnicity, Age, Facility Type, Median Household Income for Each Patient's Area of Residence, Percentage of Adults in the Patient's Zip Code Who Did Not Graduate From High School, Charlson-Deyo Comorbidity Coefficient, and Insurance Status

Clinical or Sociodemographic Covariate	AOR	95% CI	P
Race			
Chinese	Ref	—	NA
Japanese	1.15	1.04 to 1.27	.005
Filipino	1.18	1.08 to 1.28	< .001
Native Hawaiian	1.37	1.19 to 1.59	< .001
Korean	1.11	0.97 to 1.26	.115
Vietnamese	1.04	0.91 to 1.18	.592
Laotian	1.39	0.94 to 2.07	.100
Hmong	3.45	1.30 to 9.17	.013
Kampuchean	1.33	0.88 to 2.02	.174
Thai	0.73	0.50 to 1.06	.094
Asian Indian or Pakistani	1.00	0.90 to 1.10	.927
Asian Indian	0.94	0.83 to 1.07	.370
Pakistani	1.14	0.83 to 1.56	.422
Pacific Islander	1.38	1.18 to 1.61	< .001
Age			
Age (continuous)	1.05	1.05 to 1.05	< .001
Facility type			
Community cancer program	Ref	—	NA
Comprehensive community cancer program	0.87	0.78 to 0.97	.011
Academic or research program	0.84	0.75 to 0.93	.001
Integrated network cancer program	0.90	0.78 to 1.04	.157
Zip code-wide median household income			
< \$40,227 USD	Ref	—	NA
\$40,227-\$50,353 USD	1.05	0.90 to 1.22	.517
\$50,354-\$63,332 USD	1.08	0.94 to 1.24	.306
≥ \$63,333 USD	1.09	0.94 to 1.26	.236
Zip code-wide percent without high school education			
< 7.0	0.84	0.76 to 0.94	.002
7.0-12.9	0.86	0.78 to 0.94	.002
13.0-20.9	0.85	0.78 to 0.94	.001
≥ 21.0	Ref	—	NA
Charlson-Deyo comorbidity score			
0	Ref	—	NA

(continued in next column)

TABLE A4. AORs and 95% CIs for Asian American, Native Hawaiian, and Pacific Islander Patients Only Comparing the Odds of Presenting at Progressively Higher Risk Group on the Basis of Race or Ethnicity, Age, Facility Type, Median Household Income for Each Patient's Area of Residence, Percentage of Adults in the Patient's Zip Code Who Did Not Graduate From High School, Charlson-Deyo Comorbidity Coefficient, and Insurance Status (continued)

Clinical or Sociodemographic Covariate	AOR	95% CI	P
1	1.04	0.96 to 1.13	.291
2	1.37	1.13 to 1.66	.001
≥ 3	1.25	0.91 to 1.72	.167
Insurance			
Uninsured	Ref	—	NA
Private insurance or managed care	0.53	0.44 to 0.65	< .001
Medicaid	0.86	0.69 to 1.06	.154
Medicare	0.53	0.44 to 0.64	< .001
Other government	0.45	0.31 to 0.66	< .001
Unknown	0.81	0.60 to 1.10	.180
Year of diagnosis			
2004	Ref	—	NA
2005	0.99	0.85 to 1.15	.883
2006	0.95	0.82 to 1.10	.517
2007	0.93	0.80 to 1.07	.315
2008	1.14	0.99 to 1.32	.075
2009	1.19	1.02 to 1.38	.024
2010	1.00	0.86 to 1.16	.996
2011	1.13	0.98 to 1.31	.099
2012	1.16	0.99 to 1.35	.063
2013	1.33	1.14 to 1.55	< .001
2014	1.72	1.46 to 2.02	< .001
2015	1.62	1.39 to 1.89	< .001
2016	3.54	3.04 to 4.12	< .001
2017	3.14	2.71 to 3.65	< .001

Abbreviations: AORs, adjusted odds ratios; NA, not available; ref, reference.

TABLE A5. AORs and 95% CIs for Asian American, Native Hawaiian, and Pacific Islander Patients Only Comparing the Odds of Receiving Treatment or Active Surveillance on the Basis of Race or Ethnicity, Age, Risk Group, Facility Type, Median Household Income for Each Patient's Area of Residence, Percentage of Adults in the Patient's Zip Code Who Did Not Graduate From High School, Charlson-Deyo Comorbidity Coefficient, and Insurance Status

Clinical or Sociodemographic Covariate	AOR	95% CI	P
Race			
Chinese	Ref	—	NA
Japanese	1.69	1.17 to 2.42	.005
Filipino	1.16	0.88 to 1.53	.307
Native Hawaiian	1.62	0.93 to 2.84	.088
Korean	1.17	0.77 to 1.77	.468
Vietnamese	0.85	0.58 to 1.25	.412
Laotian	0.96	0.33 to 2.77	.937
Hmong	—	—	—
Kampuchean	0.62	0.22 to 1.80	.383
Thai	0.82	0.29 to 2.35	.712
Asian Indian or Pakistani	0.96	0.70 to 1.32	.791
Asian Indian	1.18	0.84 to 1.64	.338
Pakistani	1.81	0.72 to 4.57	.209
Pacific Islander	1.31	0.76 to 2.25	.335
Age			
Age (continuous)	0.96	0.95 to 0.97	0
Risk group			
Intermediate risk	Ref	—	NA
High risk	1.77	1.46 to 2.16	0
Facility type			
Community cancer program	Ref	—	NA
Comprehensive community cancer program	1.55	1.12 to 2.15	.009
Academic or research program	1.64	1.20 to 2.25	.002
Integrated network cancer program	1.56	1.00 to 2.45	.052
Zip code-wide median household income			
< \$40,227 USD	Ref	—	NA
\$40,227-\$50,353 USD	1.70	1.05 to 2.74	.029
\$50,354-\$63,332 USD	1.48	0.97 to 2.25	.070
≥ \$63,333 USD	1.19	0.77 to 1.84	.428
Zip code-wide percent without high school education			
< 7.0	1.13	0.79 to 1.61	.511
7.0-12.9	0.96	0.69 to 1.32	.787
13.0-20.9	0.91	0.66 to 1.25	.558
≥ 21.0	Ref	—	NA
Charlson-Deyo comorbidity score			
0	Ref	—	NA

(continued in next column)

TABLE A5. AORs and 95% CIs for Asian American, Native Hawaiian, and Pacific Islander Patients Only Comparing the Odds of Receiving Treatment or Active Surveillance on the Basis of Race or Ethnicity, Age, Risk Group, Facility Type, Median Household Income for Each Patient's Area of Residence, Percentage of Adults in the Patient's Zip Code Who Did Not Graduate From High School, Charlson-Deyo Comorbidity Coefficient, and Insurance Status (continued)

Clinical or Sociodemographic Covariate	AOR	95% CI	P
1	1.43	1.09 to 1.87	.009
2	1.11	0.65 to 1.90	.698
≥ 3	0.87	0.44 to 1.69	.677
Insurance			
Uninsured	Ref	—	NA
Private insurance or managed care	1.61	0.92 to 2.83	.095
Medicaid	1.05	0.58 to 1.92	.873
Medicare	1.74	1.00 to 3.05	.052
Other government	—	—	—
Unknown	1.08	0.43 to 2.70	.870
Year of diagnosis			
2010	Ref	—	NA
2011	0.97	0.65 to 1.44	.871
2012	1.22	0.79 to 1.89	.375
2013	0.84	0.56 to 1.25	.380
2014	0.78	0.52 to 1.17	.227
2015	0.75	0.51 to 1.10	.136
2016	0.66	0.46 to 0.95	.026
2017	0.69	0.48 to 0.98	.039

Abbreviations: AORs, adjusted odds ratios; NA, not available; ref, reference.