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Association of Insurance and Race/Ethnicity with Disease Severity among Men Diagnosed with Prostate Cancer, National Cancer Database 2004-2006

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Abstract

Background: Previous studies documenting variations in severity of prostate cancer at diagnosis by race/ethnicity and insurance status have been limited to small sample sizes and patients ≥65 years of age. This study examines disease severity among patients ages 18 to 99 from the National Cancer Database (NCDB).

Methods: Patients diagnosed between 2004 and 2006 with prostate cancer were selected from the NCDB (n = 312,339). We evaluated the association among three disease severity measures: prostate specific antigen (PSA) level, Gleason score 8 to 10, and clinical T-stage 3/4, by race/ethnicity and insurance while adjusting for sociodemographic and clinical factors.

Results: Uninsured and Medicaid-insured patients had elevated PSA levels, higher odds of advanced Gleason score [uninsured odds ratio (OR), 1.97; 95% confidence interval (95% CI), 1.82-2.12; Medicaid OR, 1.67; 95% CI, 1.55-1.79], and advanced clinical T stage (uninsured OR, 1.85; 95% CI, 1.69-2.03; Medicaid OR, 1.49; 95% CI, 1.35-1.63) compared with privately insured patients. Black (OR, 1.19; 95% CI, 1.15-1.23), Hispanic (OR, 1.16; 95% CI, 1.10-1.23), and Asian patients (OR, 1.22; 95% CI, 1.24-1.43) had higher odds of advanced Gleason score and similar odds of advanced stage of disease relative to whites.

Conclusion: Insurance status is strongly associated with disease severity among prostate cancer patients.

Impact: Strong associations between insurance and disease severity may be related to lack of access to preventive services such as PSA screening and barriers to medical evaluation. Although the risks and benefits of PSA screening have not been fully elucidated, it is important that all men have the opportunity to be informed about this option and preventative medical services. *Cancer Epidemiol Biomarkers Prev; 19(10); 2437–44. ©2010 AACR.*

Introduction

Prostate cancer is the most frequently diagnosed cancer among men in the United States, with an estimated 192,280 new cases and 27,360 deaths in 2009 (1). Prognosis is strongly related to stage, with a 5-year relative survival rate of 100% among patients diagnosed with localized or regional disease and 30.6% among men diagnosed at advanced stage (2). Because the majority of prostate cancer patients are diagnosed with localized disease, the 5-year relative survival rate is 99.3% among all prostate cancer patients (2). Among patients with earlier-stage disease, factors associated with disease recurrence and progression include prostate specific antigen (PSA) level and Gleason score (3, 4). These factors, along with T-stage and age, are used to develop risk indices and define appropriate treatments (4).

Since 2004, cancer registries throughout the United States have collected data on PSA level and Gleason score as site-specific factors in the Collaborative Staging System (CSV1; ref. 5), providing an opportunity to examine demographic and socioeconomic factors associated with disease severity among the general population captured in cancer registries. Such studies provide insight into potential disparities in prostate cancer prevention and detection. A recent study analyzing PSA level, Gleason score, and T stage among prostate cancer cases diagnosed from 2004 to 2005 in the Surveillance, Epidemiology and Ends Results (SEER) population-based registries found relatively small differences in disease severity measures between black and white patients but did not present data for other race/ethnic groups or include information on insurance or socioeconomic status (6).

Earlier studies on disease severity have relied on clinical series, abstraction of data for relatively small samples

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of patients from central registries, and the Cancer of the Prostate Strategic Urologic Research Endeavor database, which includes over 13,000 patients with prostate cancer enrolled from 40 urology practices throughout the United States (7-9). These studies suggest that clinical severity at diagnosis varies by race and ethnicity (6, 10, 11). Previous investigations of disease severity by insurance status have been limited to patients 65 and older (many of whom are covered under Medicare), and only variations in Medicare [fee for service, health maintenance organization (HMO), and preferred provider organization (PPO)], private (HMO, PPO), and veterans affairs were examined (12).

This study extends beyond previous ones by examining disease severity among elderly and nonelderly patients, who have greater variations in insurance status, in a national sample of men in the National Cancer Database (NCDB). The NCDB collects demographic, clinical, and treatment information for patients treated at over 1,400 facilities accredited by the Commission on Cancer, representing over 70% of malignant cancer patients. This hospital-based database is unique in that it contains information about the patient's insurance status at the time of diagnosis, race/ethnicity, and comorbidities as well as the aforementioned disease severity indicators. A prior investigation of prostate cancer patients in the NCDB reported associations between race/ethnicity and insurance status and overall American Joint Committee on Cancer advanced-stage disease among patients diagnosed from 1998 to 2004 (13). This study expands on the previous NCDB study by including additional measures of disease severity (PSA level, Gleason score, clinical T stage) and adjusts for comorbidity. It also evaluates the representativeness of NCDB patients by comparing their clinical and demographic characteristics with those of patients reported to the population-based SEER registry during our study period.

Materials and Methods

Data from the NCDB hospital-based cancer registry jointly sponsored by the American Cancer Society and the American College of Surgeons were used in this study. Because no patient, provider, or hospital identifiers were examined in this study and no protected health information was reviewed, institutional review board approval was not required for this study. Patients diagnosed from 2004 to 2006 with a first primary invasive adenocarcinoma of the prostate were selected (n = 314,017). Patients <18 or >99 years of age were excluded (n = 37), and due to insufficient numbers, patients with "other forms" of government insurance (Indian Bureau of Affairs, Public Health Service) were also removed from analyses (n = 1,641). The total analytic cohort included 312,339 patients. Three separate measures of disease severity were analyzed: (*a*) PSA level, (*b*) advanced Gleason score (defined by a Gleason score of 8-10), and (*c*) advanced clinical tumor stage (defined by clinical T stage of 3 or 4). PSA level was analyzed as a continuous variable, and multivariable logistic regression was employed to analyze advanced Gleason score and advanced stage of disease, using SAS software (version 9.2; Statistical Institute).

Patients missing the outcome of interest were excluded from that particular analysis; 87.14% (n = 272,178), 95.99% (n = 299,799), and 97.95% (n = 305,940) of patients had complete data and were included in the analyses of PSA, Gleason Score, and clinical T stage, respectively. A sensitivity analysis was completed to assess the potential impact of these missing parameters. Predictors included insurance at the time of diagnosis (private, Medicaid, Medicare 18-64, Medicare ≥65, missing), race (white, Hispanic, black, Asian, other, missing), age (18-54, 55-59, 60-64, 65-69, 70-74, 75-79, ≥80), and Charlson Deyo comorbidity score (0, 1, ≥2). A modified Charlson Deyo score was calculated from preexisting comorbidities (up to six conditions) from the hospital discharge summary (14). Area-based indicators of education (percentage of adults without a high school diploma) were derived using zip code level information from 2000 U.S. census data and are reported as quartiles (≥29%, 20-28.9%, 14-19.9%, <14% or missing) of the observed distribution in the general U.S. population.

In addition to the primary analyses of all patients ages 18 to 99 years of age, secondary analyses were conducted for patients under age 65 and those 65 and older. In these analyses, insurance categories for those under age 65 were the same as those in the primary analysis whereas those for age 65 and older were Medicare with supplement, Medicare alone, Medicaid alone, Medicare with Medicaid eligibility, private, uninsured, and missing/unknown.

For the comparison of clinical and demographic characteristics among prostate cancer patients reported to the NCDB and SEER registries, patients ≥18 years of age diagnosed with their first primary invasive adenocarcinoma between 2004 and 2006 in SEER17 were considered (n = 141,305; ref. 15). PSA level, Gleason score, and advanced disease indicators among SEER patients were derived from the CSV1 variables as described above in the NCDB analysis. Differences in distributions of predictor and outcome variables were compared in bivariate analyses using χ^2 tests (α = 0.05).

Results

Descriptive characteristics of the study population, stratified by race and ethnicity, are shown in Table 1. Among the 312,339 NCDB patients with adequate information to be included in the disease severity analysis, the average PSA value was 10.30 ng/mL (±14.03) and the most frequent Gleason score category was 2-6 (48.17%). A total of 15,825 (5.07%) patients were diagnosed with clinical T-stage 3 and 3,604 (1.15%) were diagnosed with clinical T-stage 4. In our cohort, 10.29% of patients were missing information on race/ethnicity, 68.98% were white, 13.27% were black,

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Table 1. Patient characteristics by race among men diagnosed with prostate cancer, NCDB 2004-2006 (n = 312,339)

	Total n = 312,339	White n = 218,561	Hispanic n = 12,174	Black n = 41,447	Asian and PI n = 5,479	Other n = 2,535	Missing n = 32,143	P
PSA (ng/mL)								
Mean (SD)	10.30 (14.03)	9.76 (13.29)	11.48 (15.07)	12.60 (16.57)	11.74 (14.99)	11.09 (14.77)	10.34 (14.56)	
0-2.49	10.18	10.40	9.94	9.38	8.16	8.32	10.25	<0.01
≥2.5-3.99	7.52	7.94	5.69	5.44	4.96	6.27	8.62	
≥4-5.99	26.77	27.89	21.55	22.24	21.88	25.21	27.90	
≥6-9.99	22.62	22.95	22.06	21.16	27.05	21.58	21.78	
≥10	20.06	18.61	23.83	26.13	27.82	20.87	19.25	
Missing	12.86	12.21	16.94	15.66	10.13	17.75	12.19	
Gleason score								<0.01
2-6	48.17	48.98	46.39	45.48	42.60	45.56	47.90	
3+4	25.03	24.94	23.76	24.99	23.82	23.87	26.53	
4+3	9.57	9.50	9.24	9.89	12.05	10.06	9.33	
8-10	13.21	12.88	15.31	14.16	18.01	13.69	12.59	
Missing	4.01	3.07	5.30	5.48	3.52	6.82	3.65	
Clinical T stage								<0.01
T_1/T_2	91.73	92.06	90.36	90.61	91.68	89.51	91.64	
$T_3/_4$	6.22	6.03	6.73	6.92	6.50	7.38	6.27	
Missing	2.05	1.91	2.92	2.46	1.83	3.12	2.09	
Insurance								<0.01
Missing	3.03	2.68	4.58	3.46	2.59	5.56	4.13	
Private	47.04	47.05	41.79	47.59	45.77	49.19	48.27	
Uninsured	1.60	1.03	6.18	3.34	3.16	3.87	1.05	
Medicaid	1.82	0.89	7.44	4.75	6.55	6.59	1.02	
Younger Medicare	2.82	2.33	3.48	5.80	1.17	2.45	2.32	
Older Medicare	43.69	46.01	36.53	35.06	40.76	32.35	43.21	
Age (years)								
Mean (SD)	65.99 (9.14)	66.34 (9.10)	65.93 (8.92)	63.99 (4.22)	68.06 (8.98)	64.55 (8.87)	65.93 (9.08)	
18-54	10.70	9.85	10.60	15.77	6.86	13.06	10.44	<0.01
55-59	14.74	14.35	13.78	17.01	11.22	15.90	15.35	
60-64	18.59	18.48	18.21	19.53	15.13	19.80	18.80	
65-69	20.74	20.69	22.32	20.42	22.65	22.21	20.43	
70-74	16.85	17.26	17.65	14.20	19.38	15.42	16.82	
75-79	11.40	11.95	11.48	8.29	14.80	8.80	11.26	
≥80	6.99	7.42	5.96	4.80	9.95	4.81	6.90	
Charlson Deyo score								<0.01
None	85.75	86.14	85.63	82.68	88.03	85.33	86.70	
1	11.93	11.58	12.26	14.40	10.62	12.23	11.19	
≥2	2.32	2.28	2.10	2.92	1.35	2.45	2.11	
Median no high school diploma								<0.01
≥29%	14.53	9.99	42.64	34.61	14.07	20.99	8.51	
20-28.9%	20.55	19.04	19.99	28.89	17.74	19.68	20.79	
14-19.9%	22.01	23.62	12.53	15.26	17.14	18.58	24.45	
<14%	36.61	40.95	17.50	15.11	44.57	33.10	40.98	
Missing	6.30	6.40	7.34	6.13	6.48	7.65	5.28	

Abbreviation: PI, Pacific islander.

3.90% were Hispanic, 1.75% were Asian, and the remaining 0.81% were coded as other races. The median age at diagnosis varied from 64 years among black patients to 68 years among Asian patients. Black and Hispanic patients were more likely than those in other racial/ethnic groups to be uninsured or Medicaid-insured and to reside in lower socioeconomic status (SES) zip codes. White patients had the lowest

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proportion of high PSA values (≥10 ng/mL) and poorly differentiated cancers whereas the highest proportion was observed among Asian patients.

Table 2 compares demographic and clinical characteristics of prostate cancer patients in the NCDB and SEER databases from 2004 to 2006. With the exception of race/ethnicity ($P = 0.04$), there were no statistically significant differences in demographic and clinical characteristics between the two datasets. NCDB contained younger patients, SEER had a higher proportion of Hispanic patients, and PSA values and the age distribution were slightly lower in the NCDB.

In the multivariate linear regression model predicting PSA level, the estimated average PSA value was 8.83 ng/mL for those in the referent category of each covariate (which represents white, privately insured patients age 65-69 with zero comorbidities residing in the highest SES area; Table 3). Uninsured and Medicaid-insured patients' PSA levels were approximately 4 ng/mL higher than those of privately insured patients, after adjusting for age, race, comorbidity, and area level SES. Race/ethnicity was also associated with higher PSA levels in the multivariate model. Compared with white patients, on average, PSA level was higher by 2.47 ng/mL in blacks, 1.43 ng/mL in Asians, and 0.85 ng/mL in Hispanics. As anticipated, age was appreciably associated with PSA; patients ≥80 years of age had PSA levels 4.72 ng/mL higher compared with that in age 65 to 69. In subanalyses for patients age ≤65 years of age, the results were generally similar to those in the primary analysis of all patients (Supplementary Appendix A). In the analysis of men ≥65 years, patients with Medicare only, Medicare with Medicaid supplement, Medicaid, and uninsured patients had PSA levels that were 1.11, 2.06, 3.24, and

Table 2. Comparison of clinical and demographic characteristics of prostate cancer patients reported to SEER 17 and NCDB 2004-2006

	SEER17 *n* (%)	NCDB *n* (%)	*P*
PSA (ng/mL)			0.82
0-2.49	9,655 (6.83)	31,784 (10.18)	
≥2.5-3.99	9,329 (6.60)	23,497 (7.52)	
≥4-5.99	36,407 (25.76)	83,606 (26.77)	
≥6-9.99	33,903 (23.99)	70,637 (22.62)	
≥10	34,134 (24.16)	62,654 (20.06)	
Missing	17,877 (12.65)	40,161 (12.86)	
Gleason score			0.97
2-6	65,971 (46.69)	150,441 (48.17)	
3+4	33,938 (24.02)	78,186 (25.03)	
4+3	13,563 (9.60)	29,903 (9.57)	
8-10	20,438 (14.46)	41,269 (13.21)	
Missing	7,395 (5.23)	12,540 (4.01)	
Clinical T stage			0.36
T_1/T_2	132,177 (93.54)	286,511 (91.73)	
$T_3/_4$	4,631 (3.28)	19,429 (6.22)	
Missing	4,497 (3.18)	6,399 (2.05)	
Age			0.76
18-54	13,337 (9.44)	33,425 (10.70)	
55-59	18,845 (13.34)	46,033 (14.74)	
60-64	23,783 (16.83)	58,073 (18.59)	
65-69	26,911 (19.04)	64,768 (20.74)	
70-74	23,924 (16.93)	52,615 (16.85)	
75-79	18,788 (13.30)	35,605 (11.40)	
≥80	15,717 (11.12)	21,820 (6.99)	
Race			0.04
Non-Hispanic, white	100,078 (70.82)	218,561 (69.98)	
Hispanic	12,489 (8.84)	12,174 (3.90)	
Black	16,630 (11.77)	41,447 (13.27)	
Asian and PI	6,685 (4.73)	5,479 (1.75)	
Other	612 (0.43)	2,535 (0.81)	
Missing	16,630 (11.77)	32,143 (10.29)	

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Table 3. Multivariable model predicting PSA level among men diagnosed with prostate cancer, NCDB 2004-2006 (n = 272,178)

	n	β estimate (SE)	*P*
Intercept		8.83 (0.10)	<0.01
Insurance			
Private	129,157	Referent	
Uninsured	4,194	4.25 (0.22)	<0.01
Medicaid	4,737	3.97 (0.21)	<0.01
Younger Medicare	7,686	1.37 (0.17)	<0.01
Older Medicare	119,480	0.18 (0.09)	0.05
Missing	6,924	0.96 (0.17)	<0.01
Race/Ethnicity			
White	191,875	Referent	
Hispanic	10,112	0.85 (0.15)	<0.01
Black	34,958	2.47 (0.08)	<0.01
Asian and PI	4,924	1.43 (0.20)	<0.01
Other	2,085	1.07 (0.31)	<0.01
Missing	28,224	0.61 (0.09)	<0.01
Age (years)			
65-69	28,844	Referent	
18-54	40,074	−1.21 (0.12)	<0.01
55-59	50,765	−1.13 (0.11)	<0.01
60-64	57,102	−0.65 (0.11)	<0.01
70-74	46,748	0.68 (0.09)	<0.01
75-79	31,476	1.66 (0.10)	<0.01
≥80	17,169	4.72 (0.12)	<0.01
Charlson Deyo score			
None	234,474	Referent	
1	31,743	−0.28 (0.08)	<0.01
≥2	5,961	0.97 (0.18)	<0.01
Median no high school diploma			
≥29%+	38,643	Referent	
20-28.9%	55,641	0.63 (0.07)	<0.01
14-19.9%	60,424	1.02 (0.07)	<0.01
<14%	100,301	1.49 (0.09)	<0.01
Missing	17,169	0.20 (0.12)	0.09

4.20 ng/mL higher (all $P < 0.01$) than patients with private insurance, respectively (Supplementary Appendix B). Race was also a significant predictor of PSA level among older men; blacks had PSA levels 2.78 ng/mL higher on average than whites.

In the multivariate analysis of Gleason score (Table 4), there was a clear trend towards increasing Gleason score with age; the odds of presenting with high-grade cancer in the men over age 80 were 3.26 times that of men ages 65 to 69. Poorly differentiated Gleason score was also strongly related to being uninsured [odds ratio (OR), 1.97; 95% confidence interval (95% CI), 1.82-2.12] and Medicaid insured (OR, 1.67; 95% CI, 1.55-1.79). Black (OR, 1.19; 95% CI, 1.15-1.23), Asian (OR, 1.33; 95% CI, 1.24-1.43), and Hispanic (OR, 1.16; 95% CI, 1.10-1.23) had increased odds of Gleason Score 8 to 10 compared with whites. In subanalyses of patients under and over age 65, results for under age 65 were similar to those in the primary analysis of all patients (Supplementary Appendix A). Among men age 65 and older, there were no significant differences in high-grade disease among men with Medicare plus supplemental insurance, privately insured patients, Medicare with Medicaid eligibility, and Medicare alone (Supplementary Appendix B). However, the odds for uninsured patients and those with Medicaid insurance were higher (OR, 1.55; 95% CI, 1.35-1.79; and OR, 1.45; 95% CI, 1.30-1.63, respectively) than for privately insured patients in older men.

In the multivariate analysis of diagnosis with advanced stage of disease (Table 4), uninsured (OR, 1.85; 95% CI, 1.69-2.03) and Medicaid-insured (OR, 1.49; 95% CI, 1.35-1.63) patients and older patients were more likely to be diagnosed with advanced disease. The odds of advanced stage of disease were comparable across race/ethnicity groups. In analyses of patients age 65 and older, there were higher odds for patients with

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Table 4. Multivariable models predicting Gleason's score and advanced stage of disease among men diagnosed with prostate cancer, NCDB 2004-2006

	Advanced Gleason score, *n* = 299,799			Advanced clinical T stage, *n* = 305,940		
	Advanced Gleason score (*n*)	OR (95% CI)	*P*	Advanced stage (*n*)	OR (95% CI)	*P*
Insurance						
Private	14,956	1.00		9,277	1.00	
Uninsured	948	1.97 (1.82-2.12)	<0.01	547	1.85 (1.69-2.03)	<0.01
Medicaid	1,040	1.67 (1.55-1.79)	<0.01	524	1.49 (1.35-1.63)	<0.01
Younger Medicare	982	1.16 (1.08-1.24)	<0.01	635	1.08 (0.99-1.18)	0.08
Older Medicare	22,205	1.03 (1.00-1.07)	0.08	7,863	0.99 (0.94-1.04)	0.75
Missing	1,138	1.18 (1.10-1.26)	<0.01	583	1.09 (1.00-1.19)	0.05
Race/Ethnicity						
White	28,157	1.00		13,182	1.00	
Hispanic	1,864	1.16 (1.10-1.23)	<0.01	819	1.02 (0.95-1.10)	0.56
Black	5,867	1.19 (1.15-1.23)	<0.01	2,870	1.06 (1.01-1.11)	0.01
Asian and PI	987	1.33 (1.24-1.43)	<0.01	356	1.05 (0.94-1.17)	0.37
Other	347	1.15 (1.02-1.29)	0.02	187	1.17 (1.01-1.36)	0.04
Missing	4,047	0.99 (0.96-1.03)	0.56	2,015	1.04 (0.99-1.09)	0.10
Age (years)						
65-69	7,761	1.00		3,986	1.00	
18-54	2,756	0.65 (0.62-0.68)	<0.01	2,317	1.12 (1.05-1.19)	<0.01
55-59	4,255	0.74 (0.71-0.78)	<0.01	3,068	1.07 (1.01-1.14)	0.02
60-64	6,159	0.86 (0.82-0.89)	<0.01	3,847	1.05 (0.99-1.11)	0.10
70-74	7,514	1.24 (1.20-1.28)	<0.01	2,780	0.86 (0.81-0.90)	<0.01
75-79	6,531	1.70 (1.64-1.76)	<0.01	1,685	0.77 (0.72-0.81)	<0.01
≥80	6,293	3.26 (3.14-3.39)	<0.01	1,746	1.39 (1.31-1.48)	<0.01
Charlson Deyo score						
None	34,537	1.00		16,250	1.00	
1	5,396	1.10 (1.06-1.13)	<0.01	2,606	1.16 (1.11-1.21)	<0.01
≥2	1,336	1.34 (1.26-1.42)	<0.01	573	1.33 (1.22-1.45)	<0.01
Median no high school diploma						
≥29%	6,721	1.00		3,156	1.00	
20-28.9%	8,580	1.05 (1.02-1.08)	<0.01	4,149	1.06 (1.02-1.10)	0.01
14-19.9%	9,205	1.02 (0.99-1.05)	0.15	4,263	1.09 (1.04-1.13)	<0.01
<14%	14,330	1.11 (1.07-1.15)	<0.01	6,708	1.14 (1.09-1.20)	<0.01
Missing	2,433	0.99 (0.94-1.04)	0.74	1,153	0.97 (0.91-1.04)	0.37

Medicare alone (OR, 1.15; 95% CI, 1.07-1.23), Medicare with Medicaid (OR, 1.14; 95% CI, 1.02-1.28), Medicaid alone (OR, 1.38; 95% CI, 1.16-1.63), and uninsured patients (OR, 1.98; 95% CI, 1.63-2.37) compared with patients with private insurance (Supplementary Appendix B).

Discussion

In a large national sample of men diagnosed with prostate cancer in 2004-2006, we found that men who were uninsured or Medicaid insured at the time of diagnosis had significantly higher PSA levels, clinical T stage, and Gleason scores than men with private insurance. Greater disease severity among men who are uninsured or Medicaid insured likely reflects lower access to medical care and utilization of PSA testing and a higher proportion of non–screen-detected cancers. National surveys have documented lower PSA screening rates among uninsured versus insured men, men with public versus private/military insurance, and men without versus those with a usual source of medical care (16). There is considerable uncertainty and debate about the overall risks and benefits of PSA screening due to limited evidence of an impact on mortality and considerable morbidity associated with treatment. The American Cancer Society and several other organizations recommend that men should have an opportunity to make an informed decision with their health care provider after receiving information about the uncertainties, risks, and potential benefits. All three indicators of disease severity examined in this study are clinically important in defining treatment options and prognosis for prostate cancer patients. At least two of these (PSA and T stage) are thought to be progressive over time, and thus, potentially preventable by early detection and treatment. It is thought that many high-grade cancers have a short lead time and greater

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propensity to grow quickly and invade other tissues from the time they arise (17). However, this study and others suggest that some high-grade cancers have a longer natural history in which they progress from low- to high-grade by dedifferentiation and are potentially amenable to intervention (18). Increased disease severity among patients coded as insured by Medicaid may be due in part to retroactive enrollment of uninsured individuals after their cancer diagnosis, and may not reflect access to care among persons continuously insured by Medicaid. Although disease severity did not differ between patients over age 65 with Medicare insurance and privately insured patients of all ages, in analyses restricted to patients over age 65, differences were observed between Medicare alone/Medicare plus Medicaid and privately insured/Medicare plus supplement subgroups. It is unknown whether these differences arise directly from insurance or financial barriers to care or other factors related to receipt of primary and preventive care.

Variations in disease severity were also observed between racial/ethnic groups, although of lower magnitude than variations by insurance status. Differences in disease severity by race/ethnicity may reflect non–insurance-related barriers to medical care, such as lower income, prior experiences and trust in the healthcare system, language and geographic barriers, cultural and communication differences between patients and physicians, and knowledge and attitudes about cancer prevention and early detection (19, 20). Variations in environmental and lifestyle factors, as well as biological or genetic variations, may also influence disease severity (21-24). Although black men had significantly greater disease severity than white men for all three indicators, these differences are attenuated by adjustment for insurance status. In recent national surveys, PSA screening rates among black and white men are found to be similar (25, 26) and substantially higher than those among Hispanic and Asian men.

A strong relationship between older age (≥70 years) at diagnosis and advanced Gleason score was observed in this study. This observation was especially striking for patients in the oldest age category where the likelihood of advanced Gleason score among men ≥80 was three times that of men age 65 to 69. This finding, as well as the positive association between PSA and age, is consistent with previous studies (6, 27) and may be in part due to reduced screening intensity in older men, leading to an increased time to diagnosis and progression from low- to high-grade tumor by dedifferentiation (27).

To our knowledge, this study is the first to examine PSA and Gleason score among Asian patients in a large national cohort. Previous studies examining disease severity among Asian patients have reported higher SEER summary stage and grade compared with white patients (28, 29). Although we observed elevated PSA and Gleason scores among Asian patients in our study, we did not observe a higher probability of advanced clinical T stage. Further study of disease severity and prognosis among Asian patients is warranted; despite their higher prevalence of adverse prognostic markers, Asian patients experience higher survival rates than other racial/ethnic groups (28, 29).

A limitation of this study is the lack of data on newly diagnosed patients who were not treated at hospitals accredited by the Commission on Cancer. The NCDB, a hospital-based registry, may capture a smaller proportion of men diagnosed in nonhospital settings and/or men not receiving radical prostatectomy or radiation. We believe this potential selection bias in our study is minimal given the remarkable similarity in disease severity and demographic characteristics between NCDB and SEER patients during the study time frame. A sensitivity analysis examining factors related to missing PSA, Gleason score, and clinical T-stage data elements revealed that uninsured, Medicaid-insured, black, and patients ≥75 years of age are more likely to be missing data elements. The potential selection bias that results from missing data elements is relatively minor for the Gleason score and clinical stage analyses where only 4% and 2% of patients were missing these data items, respectively. An additional limitation of this study is that there has not been a formal validation study of the data on insurance status in the NCDB. This variable has been collected by the NCDB since 1996 based on the patient's primary payer/insurance carrier at the time of initial diagnosis and/or treatment, an item that is required to be recorded on the patient admission page by the Joint Commission on Accreditation of Healthcare Organizations. Although this variable does not reflect continuity of insurance or type of insurance over time, it is likely to reflect insurance coverage in the period prior to diagnosis and at the time initial treatment is administered in most cases, with the exception that was previously noted regarding Medicaid-insured patients (30). An additional limitation is that we were unable to control for body mass index, which is known to vary by race/ethnicity and has been shown to affect PSA levels (21, 22, 24).

Despite these limitations, this study is the first to examine the relationship between disease severity outcomes (PSA, Gleason score, and T stage) and race/ethnicity and insurance in a large national sample of men. Strong associations between insurance and disease severity are likely to be related to lack of access to preventive services such as PSA screening and barriers to timely medical evaluation of urologic symptoms. Although there are unresolved questions about risks and benefits of PSA screening, it is important that all men have the opportunity to be informed about this option as well as access to other preventative health services and primary care. In addition, it highlights the importance of continued research to reduce uncertainties about the prevention and early detection of prostate cancer, prognostic factors, and improved treatment.

Disclosure of Potential Conflicts of Interest

No potential conflicts of interest were disclosed.

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