Use of the Prostate-Specific Antigen Test among U.S. Men: Findings from the 2005 National Health Interview Survey

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Abstract

Background: **Although evidence that prostate cancer deaths are reduced by screening for elevated prostate-specific antigen (PSA) concentration coupled with early diagnosis and treatment is insufficient to advocate routine screening for prostate cancer, PSA testing has become more common in the past decade. We examined characteristics that might influence testing and compared test use between men ages 40 to 49 and 50 to 79 years.**
Methods: **We used data from 7,669 participants with no history of prostate cancer in the 2005 National Health Interview Survey.**
Results: **Among men reporting about PSA testing, an estimated 16% of 40- to 49-year-old men and 49% of 50- to 79-year-old men had a PSA test in the past 2 years. In multivariate analyses, among men ages 40 to 49 years, non-Hispanic Black men were more likely ($P < 0.05$) to have had a PSA test than non-Hispanic White men. We found no significant difference by race/ethnicity in men ages 50 to 79 years. Higher education, higher poverty threshold, usual source of medical care, family history of prostate cancer, and comorbid conditions were associated with increased PSA test use in both age groups. Additionally, men ages 50 to 79 years born in the United States, who were married, had private or military health insurance, and had been diagnosed with another cancer type were more likely to be tested.**
Conclusions: **Findings from the multivariate analyses indicated significantly higher PSA test use among younger non-Hispanic Black men than among non-Hispanic White men. These findings may indicate that healthcare providers are getting and conveying the message of increased risk of prostate cancer among African American men.** (Cancer Epidemiol Biomarkers Prev 2008;17(3):636–44)

Introduction

Prostate cancer is the most common cancer, other than some types of skin cancer, and the second leading cause of cancer mortality among men in the United States (1). According to the Centers for Disease Control and Prevention, an estimated 189,075 American men were diagnosed with prostate cancer and 29,002 died from the disease in 2004 (1). Although prostate cancer incidence varies, at least to some extent, by demographic, social, and health characteristics, the overall incidence of prostate cancer has remained stable over the last decade and its mortality has fallen (2).

The U.S. Food and Drug Administration approved the prostate-specific antigen (PSA) test more than a decade ago for monitoring and early detection of prostate cancer (3). In 2002, the U.S. Preventive Services Task Force (USPSTF) concluded that the evidence was insufficient to advocate for or against routine prostate cancer screening using the PSA test and digital rectal examination (4). Specifically, the USPSTF determined that older men with comorbid conditions and a life expectancy of <10 years were unlikely to benefit from prostate screening (4). However, the USPSTF, under clinical considerations, indicated that if early detection improves health outcomes (which is not currently known), those most likely to benefit from screening are men at average risk of the disease ages 50 to 70 years and men ages ≥45 years at increased risk, such as African American men and those who have a first-degree relative with prostate cancer (4). The USPSTF and other organizations also recommended that physicians discuss potential benefits and risks associated with prostate cancer testing with their patients (4, 5).

Because African American men and men with a family history of prostate cancer are at increased risk of developing prostate cancer at a younger age than other men, the American Cancer Society recommends that physicians offer these patients the option of having a PSA test and digital rectal examination starting at age 45 (5). The American Cancer Society also recommends that men with several first-degree relatives who had prostate cancer at a young age begin testing at age 40 (5). Unlike the USPSTF, the American Cancer Society does not recommend that prostate cancer screening stop at age 70 (5). PSA testing for prostate cancer is common (4), and whether the test is done at the request of the physician or patient, >50% of men ages ≥50 years have had at least

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one PSA test in their lifetime (6-8). Previous research on PSA testing indicates that testing rates vary by age, race, and socioeconomic characteristics (6, 9).

Although PSA testing has become more common in the past decade, limited published data exist about the rates of PSA testing in subpopulations of men with demographic or social characteristics that could influence the use of PSA. We therefore conducted our analysis to compare PSA test use in men ages 40 to 49 years with use in older men using data from the 2005 National Health Interview Survey (NHIS; ref. 10). Specifically, we examined PSA test use along with demographic, socioeconomic, and healthcare access factors identified in the literature that might influence test use (6, 7, 11).

Materials and Methods

The NHIS is an annual health survey conducted by the National Center for Health Statistics of the Centers for

Table 1. Characteristics of men ages 40 to 79 years who had not had prostate cancer in the 2005 NHIS by age group (n = 7,669)

Variable	Age 40-49 y (n = 2,777)		Age 50-79 y (n = 4,892)	
	n*	%†	n*	%†
Demographics				
Age (y)				
50-64			4,892	69.8
65-79				30.2
Race or ethnicity	2,777		4,892	
Non-Hispanic White		73.5		79.0
Non-Hispanic Black		10.1		9.1
Hispanic		12.1		7.8
Non-Hispanic other		4.3		4.1
Region	2,777		4,892	
Northeast		18.0		20.9
Midwest		25.1		23.6
South		34.5		34.9
West		22.4		20.6
Length of U.S. residence (y)	2,758		4,866	
<10		2.7		1.5
≥10 but not born in U.S.		13.0		10.9
Born in U.S.		84.3		87.6
Socioeconomic variables				
Education	2,761		4,826	
Less than high school		12.9		15.7
High school graduate		31.2		29.1
Some college		26.5		24.6
College graduate		29.5		30.6
Income	2,777		4,892	
<$20,000		8.6		9.2
$20,000–<$35,000		15.4		9.3
$35,000-<$75,000		30.0		17.6
≥$75,000		15.5		9.7
Missing, refused, or ''don't know''		30.4		54.2
Poverty threshold (%)	2,777		4,892	
<200		15.3		16.2
200-<300		12.8		10.3
300-<400		13.6		10.4
400-<500		10.5		8.2
≥500		28.6		28.8
Unknown		19.2		26.1
Marital status	2,761		4,860	
Married or living with a partner		74.7		77.8
Divorced or separated‡		13.7		12.6
Widowed				3.8
Never married		11.6		5.8
Healthcare access issues				
Health insurance	2,766		4,877	
None		17.7		8.6
Public		6.1		14.5
Private or military		76.2		77.0
Have a usual source of medical care	2,754		4,831	
Yes		82.6		90.6
No		17.4		9.4
Seen physician or healthcare provider in past year	2,732		4,788	
Yes		73.9		85.7
No		26.1		14.3

(*Continued on the following page*)

Table 1. Characteristics of men ages 40 to 79 years who had not had prostate cancer in the 2005 NHIS by age group (*n* = 7,669) (Cont'd)

Variable	Age 40-49 y (*n* = 2,777)		Age 50-79 y (*n* = 4,892)	
	*n**	%†	*n**	%†
Health status				
Reported health status	2,775		4,890	
Excellent		30.7		21.2
Very good		34.5		29.6
Good		25.3		30.4
Fair or poor		9.5		18.8
Family history of prostate cancer	2,535		4,399	
Yes		5.5		7.7
No		94.5		92.3
No. chronic diseases	2,777		4,892	
None		68.0		42.6
1		23.2		30.6
2		6.5		17.3
3		1.7		6.6
≥4		0.6		2.9
Ever told had cancer	2,777		4,892	
Yes		2.4		10.2
No		97.6		89.8

*Numbers might not add up to the totals in the table due to ''don't know,'' refused, or missing responses.
†% Population estimates adjusted for the NHIS sampling design. Totals might not add to 100% because of rounding.
‡For men ages 40 to 49 y, this category includes widowers.

Disease Control and Prevention (10). The survey represents the noninstitutionalized adult population in the United States. The NHIS has several core questionnaires with basic demographic and health items that it incorporates each year as well as one or more sets of questions (''supplements'') on current health topics that vary from year to year. The 2005 NHIS survey included a cancer supplement that contained items on family history of prostate cancer and prostate cancer screening using the PSA test. The survey information was collected through computer-assisted personal interviews conducted by trained U.S. Census Bureau staff. The adult sample included persons ages ≥18 years residing in the household. One adult per family was randomly selected for the interview. Black and Hispanic populations were oversampled to allow more precise estimates.

Study Population. A total of 31,428 adults in 39,284 sampled families were interviewed. The final adult response rate was 69.0% (12). Of a sample of 7,885 men ages 40 to 79 years, the current analysis excluded 201 men who had a history of prostate cancer before their interview and 15 men for whom information about prostate cancer was missing. Of the remaining 7,669 men, 6,854 reported information about PSA testing, 164 men refused to answer whether they had a test, 242 did not know the answer to that question, and the information for 336 men was not ascertained. Additional 73 men were excluded because of missing information regarding the time of their most recent test.

Data Collection. Male respondents were asked several questions about prostate cancer and PSA testing, including whether they had ever had a PSA test and, if so, the time of their most recent test and the main reason for undergoing it. The 2005 NHIS did not collect information on digital rectal examination.

The National Center for Health Statistics recoded data on race or ethnicity into four categories: non-Hispanic White, non-Hispanic Black, Hispanic, and non-Hispanic other. Hispanics included Puerto Rican, Mexican, Mexican American, Cuban or Cuban American, Central or South American, and other Spanish. Poverty status was calculated as the income-to-poverty ratio and based on an index developed from U.S. Census Bureau information on 2004 poverty levels based on income (13).

We determined access to healthcare using three variables: (*a*) whether respondents had no health insurance, public health insurance, or private or military health insurance; (*b*) whether respondents had a usual source of care (excluding emergency room visits); and (*c*) whether respondents had seen a doctor or healthcare provider in the past year. The health status characteristics that might have influenced PSA test use according to the literature that we analyzed in this study included self-reported overall health, having a family history of prostate cancer (respondent's father, brother, or son was diagnosed previously with prostate cancer), number of self-reported chronic diseases (including hypertension, stroke, emphysema, diabetes, chronic bronchitis, failing kidneys, liver condition, and heart disease), and having ever been diagnosed with any cancer other than prostate cancer. We also recoded self-reported health status as excellent, very good, good, or fair or poor. These and other variables that could influence PSA test use are presented in Table 1.

Data Analysis. The NHIS used a stratified, multistage-cluster sample (13). We used the statistical program SUDAAN (version 9.1) in the analysis to account for the complex sampling survey design and nonresponse (14). We obtained sample weights from the NHIS 2005 public use data file to calculate population estimates and their 95% confidence intervals.

We examined PSA test use for any reason in the previous 2 years. The decision to examine test use in the past 2 years rather than the past year intended to reduce the number of inaccurate responses about PSA testing dates that might have occurred if the testing dates were

earlier than reported by participants. We decided to include PSA tests conducted for any purpose in this study after completing an additional analysis using only PSA tests for routine examination and obtaining very similar results to those of the current analysis.

We stratified this analysis into two age groups (40-49 and 50-79 years) to explore differences in demographic and health characteristics associated with PSA test use in these populations. We used χ^2 tests, which are analogous to the standard Pearson χ^2 tests for nonsurvey data, to examine the association between each covariate and PSA test use in the past 2 years. We used multivariate logistic regression models to estimate the percentages of men having had a PSA test in the past 2 years after adjusting for all other covariates in the models. We removed the covariate ''seen physician or healthcare provider in the past year'' from the multivariate analysis because the period mentioned did not match the period used in our analysis. We also removed from the analyses data with missing information due to a refusal to answer or a lack of knowledge about the time of the most recent PSA test.

We present the results as adjusted percentages or predicted margins. We calculated the predicted margins for each subgroup from the logistic regression model as the average of the predicted probabilities of PSA test use, assuming that all survey participants were in that subgroup (15). These adjusted percentages allow easy comparisons among categories within a covariate. We used general linear contrasts to assess the statistical differences of estimates compared with a reference level within a factor.

Results

Of the 7,885 men ages 40 to 79 years in our sample, 7,669 had no history of prostate cancer, representing an

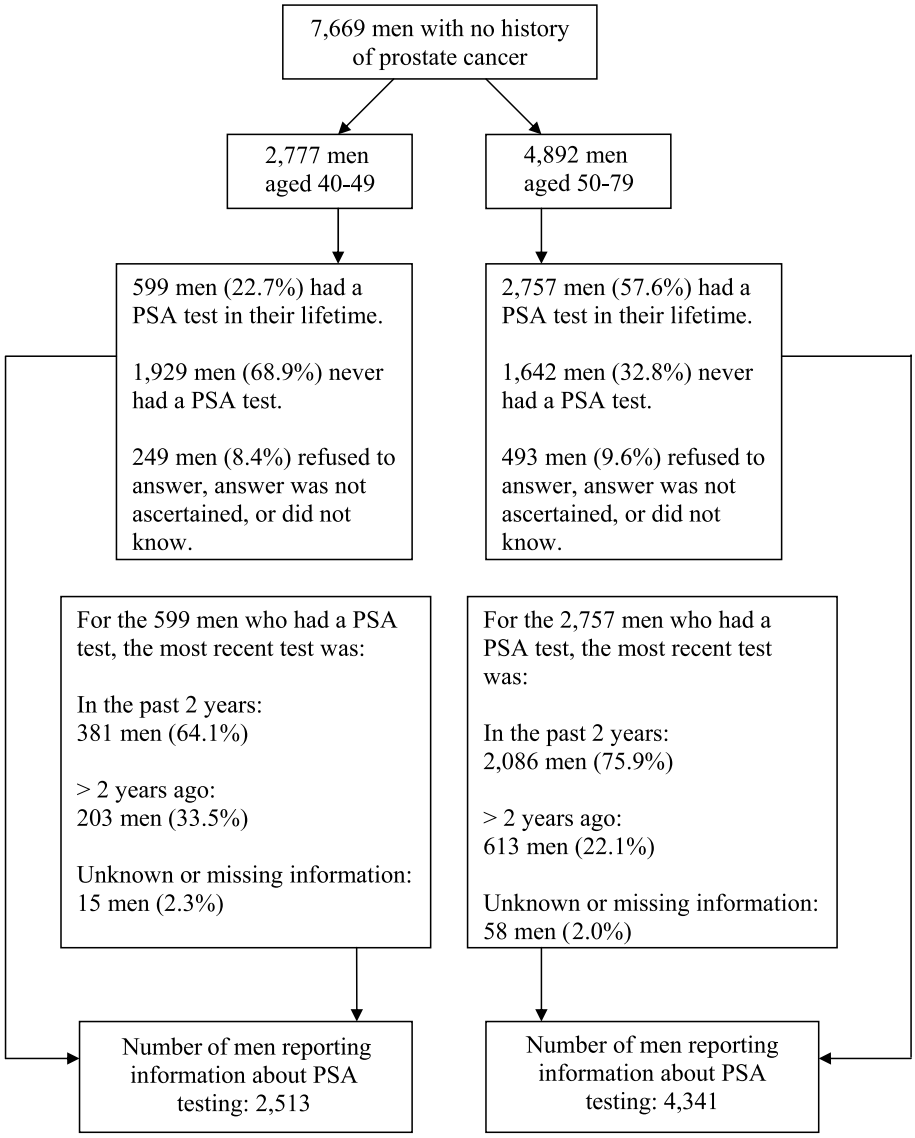

Figure 1. PSA test use among men ages 40 to 79 years by age group,* NHIS 2005. *Percentages are population estimates.

* Percentages are population estimates.

estimated population of 55.8 million persons. Of these men, 2,777 were 40 to 49 years old and 4,892 were 50 to 79 years old (Fig. 1). Among men who underwent PSA testing, most had had their most recent test during a routine examination (86.5% for ages 40-49 years and 90.3% for ages 50-79 years). However, 9.0% of those ages 40 to 49 years and 7.2% ages 50 to 79 years were tested because of a problem.

The distributions of respondents' characteristics, which reflected the U.S. male population, are presented in Table 1. Men were mainly non-Hispanic White men, born in the United States, and married or living with a partner. Most had public or private health insurance and a usual source of care. However, compared with men ages 50 to 79 years, a larger percentage of those ages 40 to 49 years were Hispanic or never married, lacked health insurance or a usual source of medical care, reported being in excellent health and less often in fair or poor condition, and had no comorbid conditions and other types of cancer.

We present findings from the unadjusted analyses, in which we modeled the association between personal characteristics and PSA test use in the past 2 years (Table 2). Among men reporting information about PSA testing, an estimated 16% of men ages 40 to 49 years and 49% of men ages 50 to 79 years reported having had a PSA test in the past 2 years. Among the younger men, use of PSA test was highest in non-Hispanic Black men

Table 2. Estimated percentage of men ages 40 to 79 years who had not had prostate cancer and had reported a PSA test for any reason within the past 2 years, by age group, NHIS 2005

Variable	Age 40-49 y			Age 50-79 y		
	*n** (%†)	95% CI	*P*‡	*n** (%†)	95% CI	*P*‡
Demographics						
All men	2,513 (16.0)	14.5-17.6		4,341 (49.0)	47.2-50.8	
Age (y)				4,341		<0.001
50-64				2,909 (43.7)	41.7-45.8	
65-79				1,432 (61.2)	58.4-64.0	<0.001
Race or ethnicity	2,513		0.037	4,341		<0.001
Non-Hispanic White	1,688 (15.6)	13.9-17.5		3,170 (51.9)	49.9-54.0	
Non-Hispanic Black	293 (23.0)	17.6-29.5	0.021	533 (42.8)	37.2-48.5	0.004
Hispanic	430 (12.8)	9.6-16.7	0.169	488 (35.0)	30.2-40.2	<0.001
Non-Hispanic other	102 (14.3)	7.4-25.9	0.781	150 (33.6)	25.3-43.1	<0.001
Region	2,513		0.005	4,341		0.070
Northeast	427 (21.2)	17.5-25.4		817 (49.9)	46.1-53.8	
Midwest	574 (12.9)	10.2-16.4	0.002	1,008 (47.5)	43.8-51.3	0.383
South	896 (17.1)	14.9-19.6	0.087	1,577 (51.5)	48.5-54.4	0.540
West	616 (13.3)	10.4-17.0	0.003	939 (45.5)	42.0-49.1	0.097
Length of U.S. residence (y)	2,496		0.391	4,325		<0.001
<10	89 (11.8)	5.2-24.6	0.332	65 (28.5)	14.8-47.9	0.010
≥10	382 (14.0)	10.2-18.9	0.284	517 (34.5)	29.8-39.5	<0.001
Born in U.S.	2,025 (16.5)	14.9-18.3		3,743 (51.2)	49.3-53.1	
Socioeconomic variables						
Education	2,505		<0.001	4,299		<0.001
Less than high school	388 (9.8)	7.0-13.5		765 (37.9)	33.6-42.3	
High school graduate	739 (10.9)	8.4-13.8	0.614	1,239 (43.0)	40.0-46.0	0.047
Some college	675 (18.0)	14.9-21.7	<0.001	1,050 (49.9)	46.4-53.5	<0.001
College graduate	703 (22.3)	19.2-25.8	<0.001	1,245 (59.8)	57.1-62.4	<0.001
Poverty threshold (%)§	2,513		<0.001	4,341		<0.001
<200	464 (9.4)	6.9-12.6		874 (33.9)	30.3-37.7	
200-<300	326 (11.2)	8.0-15.5	0.401	488 (44.7)	39.8-49.7	0.001
300-<400	345 (14.2)	10.0-19.6	0.096	458 (49.7)	44.0-55.5	<0.001
400-<500	256 (15.5)	11.1-21.2	0.040	352 (53.6)	47.4-59.7	<0.001
≥500	682 (23.8)	20.6-27.3	<0.001	1,144 (55.6)	52.3-58.9	<0.001
Unknown	440 (14.2)	10.8-18.3	0.046	1,025 (51.0)	47.5-54.5	<0.001
Marital status	2,503		0.004	4,329		<0.001
Married or living with partner	1,554 (17.3)	15.5-19.3		2,827 (51.9)	49.9-53.9	
Divorced or separated§	520 (13.3)	10.3-17.1	0.047	860 (38.5)	34.9-42.3	<0.001
Widowed				269 (48.1)	40.9-55.3	0.305
Never married	429 (10.5)	7.6-14.5	0.001	373 (32.1)	27.0-37.6	<0.001
Access to healthcare						
Health insurance	2,505		<0.001	4,332		<0.001
None	522 (6.0)	4.1-8.6	<0.001	437 (21.1)	17.2-25.7	<0.001
Public	180 (10.2)	6.2-16.3	0.002	756 (43.0)	39.0-47.1	<0.001
Private or military	1,803 (18.8)	17.0-20.8		3,139 (53.3)	51.3-55.3	
Usual source of medical care	2,512		<0.001	4,336		<0.001
Yes	1,996 (18.3)	16.5-20.2		3,864 (52.7)	50.8-54.6	
No	516 (5.4)	3.5-8.2	<0.001	472 (14.8)	11.3-19.1	<0.001
Seen physician or healthcare provider in the past year‖	2,504		<0.001	4,328		<0.001
Yes	1,790 (20.4)	18.5-22.5		3,651 (54.8)	53.0-56.7	
No	714 (3.8)	2.5-5.7	<0.001	677 (14.9)	11.9-18.5	<0.001

(*Continued on the following page*)

Table 2. Estimated percentage of men ages 40 to 79 years who had not had prostate cancer and had reported a PSA test for any reason within the past 2 years, by age group, NHIS 2005 (Cont'd)

Variable	Age 40-49 y			Age 50-79 y		
	*n** (%†)	95% CI	*P*‡	*n** (%†)	95% CI	*P*‡
Health status						
Reported health status	2,511		0.659	4,340		0.400
Excellent	734 (17.2)	14.3-20.6		862 (48.7)	45.2-52.3	
Very good	872 (14.9)	12.3-17.8	0.279	1,286 (51.2)	48.0-54.4	0.289
Good	640 (15.4)	12.4-18.9	0.456	1,326 (47.3)	44.2-50.5	0.582
Fair or poor	265 (17.3)	12.8-22.9	0.982	866 (48.4)	44.0-52.9	0.916
Family history of prostate cancer	2,447		<0.001	4,167		<0.001
Yes	127 (39.0)	29.3-49.5	<0.001	304 (66.4)	60.3-72.0	<0.001
No	2,320 (14.6)	13.1-16.2		3,863 (47.6)	45.6-49.5	
No. chronic diseases	2,513		<0.001	4,341		<0.001
None	1,732 (12.4)	10.9-14.1		1,812 (40.7)	38.2-43.3	
1	555 (25.6)	21.6-30.1	<0.001	1,325 (55.2)	52.1-58.2	<0.001
2	170 (18.6)	12.8-26.2	0.087	796 (54.4)	50.4-58.3	<0.001
≥3	56 (16.0)	8.6-27.8	0.469	408 (57.2)	52.0-62.3	<0.001
Ever told had cancer	2,513		0.023	4,341		<0.001
Yes	60 (32.1)	20.5-46.4	0.016	412 (63.8)	58.3-68.9	<0.001
No	2,453 (15.6)	14.1-17.2		3,929 (47.4)	45.5-49.2	

*Numbers may differ from totals due to ''don't know,'' refused, or missing responses.
†% Population estimates adjusted for NHIS sampling design.
‡*P* values for a χ^2 test when the *P* value is located on a row of a main effect. *P* values for a general linear contrast comparing a row's percentage to its reference level are located on the level (category) within the main effect. The reference levels are blank.
§This category includes widowers for ages 40 to 49 y.
‖Based on reported number of visits to a provider in the past year.

(23%), those from the northeast, college graduates, those with the highest poverty threshold, married men, those with private or military health insurance and a usual source of care, those with family history of prostate cancer, those who had a chronic disease, and those who had been diagnosed with another type of cancer. Men with less than high school education, those who had never married, and those who had no health insurance had the lowest percentages of PSA test use.

Men ages 50 to 79 years who had the highest percentages of PSA test use had similar characteristics to men ages 40 to 49 years with the highest percentages of testing. In addition, PSA test use in the older group was also highest among those ages 65 to 79 years, among non-Hispanic White men, those born in the United States, and those with one or more chronic diseases.

PSA test use within the past 2 years, adjusted for demographic and personal characteristics, is presented in Table 3. For most of the covariates, the patterns of PSA testing for both age groups were similar to those presented in Table 2. However, among men ages 40 to 49 years, non-Hispanic Black men and Hispanic men (with borderline significance) were more likely to be tested than non-Hispanic White men. Among men ages 50 to 79 years, Hispanic men had a higher percentage of test use than all other race or ethnicity groups. However, the difference was not significant.

Discussion

Findings from this study revealed that among men reporting information about PSA testing 16% of men ages 40 to 49 years and 49% of those ages 50 to 79 years had a PSA test for any reason during the past 2 years. Most tests were done for routine exams, and the highest percentage of test use was among men ages 65 to 79 years. Our study showed that although many personal and health-related characteristics associated with PSA test use are similar in both younger and older men, test use varies by race and ethnicity in the two age groups.

In particular, we found that non-Hispanic Black men ages 40 to 49 years were more likely to have had a PSA test than men of other racial or ethnic backgrounds in the same age group. Because Black or African American men are at higher risk of developing prostate cancer, perhaps physicians and healthcare practitioners are implementing the USPSTF clinical recommendations (4). They may have discussed with African American patients their increased prostate cancer risk, and this knowledge may have translated into more testing, especially among men ages <50 years (16-18). Furthermore, increased media coverage and other community interventions (19-22) might have increased awareness of this disease.

By combining race and ethnicity into one variable with four distinct groups and examining it in stratified analyses of men ages 40 to 49 and 50 to 79 years, the current study offers additional insight into variations in PSA test use. Our multivariate analysis showed that the percentage of test use among non-Hispanic Black men ages 50 to 79 years was similar to the percentage among non-Hispanic White men. This study does not reflect the trend found in a study of the relationship between age, race, and prostate cancer screening, which found that PSA test use in elderly African American men has been increasing more rapidly than in White men (23).

The higher percentage of test use we found among Hispanic men than non-Hispanic White men in the multivariate analyses suggests the possibility that physicians are recommending testing to Hispanic men as part of their routine exam despite the lower incidence of prostate cancer in this population. The Hispanic population is

Table 3. PSA test use for any reason within the past 2 years among men ages 40 to 79 years who had not had prostate cancer, adjusted for demographic and personal characteristics, by age group, NHIS 2005

Variable	Age 40-49 y*		Age 50-79 y*	
	% [†] (95% CI)	P [‡]	% [†] (95% CI)	P [‡]
Demographics				
Age (y)				<0.001
50-64			44.2 (42.0-46.5)	<0.001
65-79			60.6 (57.6-63.5)	
Race or ethnicity		0.002		0.238
Non-Hispanic White	14.6 (12.8-16.3)		48.8 (46.7-50.9)	
Non-Hispanic Black	25.7 (19.0-32.4)	0.002	49.9 (44.7-55.2)	0.692
Hispanic	20.1 (14.5-25.7)	0.073	55.0 (47.7-62.2)	0.123
Non-Hispanic other	15.2 (5.8-24.5)	0.903	44.6 (34.5-54.7)	0.433
Region		0.021		0.144
Northeast	20.4 (16.7-24.0)		49.4 (45.6-53.3)	
Midwest	13.5 (10.3-16.8)	0.005	47.4 (43.7-51.1)	0.457
South	16.7 (14.2-19.2)	0.105	51.6 (48.5-54.7)	0.394
West	14.2 (10.5-17.9)	0.020	46.6 (42.9-50.2)	0.285
Length of U.S. residence (y)		0.946		0.006
<10	16.8 (6.1-27.4)	0.907	39.2 (21.0-57.4)	0.233
≥10	15.4 (10.5-20.3)	0.787	39.2 (33.0-45.3)	0.001
Born in U.S.	16.1 (14.4-17.8)		50.4 (48.4-52.5)	
Socioeconomic variables				
Education		0.004		<0.001
Less than high school	13.9 (9.2-18.6)		40.2 (35.2-45.2)	
High school graduate	11.9 (9.3-14.6)	0.479	43.6 (40.6-46.7)	0.207
Some college	17.3 (14.0-20.5)	0.239	49.6 (46.1-53.1)	0.003
College graduate	19.4 (16.5-22.4)	0.061	57.9 (54.9-60.9)	<0.001
Poverty threshold (%)		0.006		0.003
<200	12.3 (8.4-16.1)		41.2 (37.0-45.5)	
200-<300	12.7 (8.8-16.5)	0.877	46.7 (41.7-51.7)	0.100
300-<400	13.0 (9.1-16.9)	0.797	50.1 (44.9-55.2)	0.007
400-<500	15.0 (10.3-19.7)	0.395	53.3 (47.6-59.0)	0.001
≥500	20.4 (17.4-23.5)	0.003	51.4 (47.8-54.9)	0.001
Unknown	16.1 (11.9-20.4)	0.172	50.3 (46.8-53.8)	0.001
Marital status		0.077		0.003
Married or living with partner	16.7 (14.8-18.5)		50.5 (48.4-52.5)	
Divorced or separated[§]	16.4 (12.5-20.3)	0.910	44.3 (40.2-48.3)	0.005
Widowed			46.5 (39.4-53.6)	0.284
Never married	11.4 (7.6-15.1)	0.014	41.1 (35.1-47.2)	0.004
Access to healthcare				
Health insurance		0.063		<0.001
None	10.5 (6.0-15.0)	0.012	39.0 (32.1-45.9)	0.001
Public	12.0 (5.8-18.1)	0.126	42.6 (38.3-47.0)	<0.001
Private or military	17.1 (15.3-18.9)		51.1 (49.1-53.1)	
Usual source of medical care		0.003		<0.001
Yes	17.1 (15.3-18.9)		51.2 (49.3-53.1)	
No	8.7 (4.9-12.4)	<0.001	25.3 (19.6-30.9)	<0.001
Health status				
Reported health status		0.259		0.589
Excellent	17.6 (14.4-20.8)		49.3 (45.6-52.9)	
Very good	14.2 (11.6-16.8)	0.101	50.3 (47.2-53.4)	0.635
Good	16.0 (12.6-19.3)	0.520	47.4 (44.2-50.6)	0.478
Fair or poor	18.9 (12.7-25.0)	0.733	50.0 (45.1-54.8)	0.828
Family history of prostate cancer		<0.001		<0.001
Yes	36.6 (26.9-46.2)	<0.001	63.2 (57.7-68.8)	<0.001
No	14.8 (13.3-16.3)		47.9 (46.0-49.9)	
No. chronic diseases		<0.001		<0.001
None	12.6 (10.8-14.4)		43.8 (41.0-46.6)	
1	24.3 (20.1-28.5)	<0.001	53.6 (50.7-56.6)	<0.001
2	19.5 (12.5-26.6)	0.075	51.9 (48.0-55.8)	0.001
≥3	18.2 (6.4-30.1)	0.367	53.7 (48.5-59.0)	0.002
Ever told had cancer		0.050		0.008
Yes	25.3 (14.6-36.0)	0.087	55.6 (50.5-60.8)	0.008
No	15.8 (14.2-17.4)		48.4 (46.6-50.3)	

*Numbers may differ from totals due to ''don't know,'' refused, or missing responses.
†% Population estimates adjusted for NHIS sampling design.
‡P values for a Wald F test when the P value is located on the row of a main effect. P values for a Wald t test when the P value is located on the level (category) within a main effect. The reference levels are blank.
§This category includes widowers for those ages 40 to 49 y.

heterogeneous and a more comprehensive analysis is required to explore the nature of variation within this population.

Our finding that men with higher socioeconomic status were more likely to be tested might be partially explained by the fact that these men tend to have greater access to healthcare and community resources and perhaps more knowledge of the disease, as shown in previous studies (6, 7, 11). Our finding that PSA test use was low among men who were divorced, widowed, and especially those who had never married might indicate that spouses and partners play an important role in encouraging men to be tested. This finding of the lowest testing percentages among single, never-married men was also presented in a previous study (7).

Perhaps because family history is a well-known risk factor for prostate cancer, PSA testing was greater among men who reported a family history of prostate cancer. The healthcare providers of these men might have encouraged these patients to consider testing. Previous studies show that when healthcare providers advise patients to undergo PSA testing, the overwhelming majority tend to comply (6), particularly if they have health insurance and a usual source of care (7).

An earlier study found that disparities in prostate cancer screening rates between patients who lacked a usual source of care and health insurance and those who had access to these resources are widening (11). Our study also found significant differences in PSA test use between men with private or military health insurance and a usual source of care and those who lacked access to these resources. Our finding that test use among men who had public insurance was similar to that of men with no insurance is noteworthy because variations in health insurance might partially explain the lack of access to preventive healthcare services, such as PSA testing. A recent systematic review of prostate cancer estimated the cost of a PSA test to range from $13.11 to $77.18, with an average of $37.23 (24). This average cost might be prohibitive for those without private or public health insurance, but it should be affordable for those with public insurance compared with other publicly funded cancer screening programs (25).

This study has some limitations. As in any interview- or survey-based study, participants might have misreported the date of their last PSA test because they had difficulty recalling the date accurately (26, 27). The rate of misreporting might have varied by personal and social characteristics, which could have led to bias (28). Also, because of small numbers in the sample, data on American Indians or Alaska natives, Asians, or other races were combined into one group, ''non-Hispanic other,'' in the race or ethnicity variable. Therefore, our results might not be representative of these populations.

Additionally, although a 69% response rate is quite substantial, an incomplete coverage of the population of men may limit our ability to draw inferences from the results if there are systematic differences between the survey respondents and nonrespondents. Nevertheless, we do not expect a distortion in the association between men's characteristics and PSA test use. Finally, because we did not collect data on type of PSA test used (such as complex PSA, free-to-total PSA, and other measures of PSA), this analysis is limited to any PSA testing. Although we excluded from our analysis men who reported having been diagnosed with prostate cancer, a small proportion of PSA tests reported in our sample had been conducted for diagnostic purposes rather than routine screening.

The strengths of this study stem from the fact that the data are from a large, well-established national survey. In addition, our examination of two age groups offers additional insight into the use of the PSA test.

Our findings could have important implications for medical and public health professionals. Our results imply that physicians and patients might be recognizing the fact that Black men are at increased risk of prostate cancer because, in spite of inconclusive evidence that PSA screening is beneficial, non-Hispanic Black men are tested more often at younger ages than non-Hispanic White men. Also, media and community campaigns that increase awareness of prostate cancer risk among Black men might have become more successful in promoting screening (20-22). However, the higher use of testing among Hispanic men than non-Hispanic White men in the multivariate analyses merits further examination to understand which factors are associated with increased PSA test use.

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