The Effect of Physician-Patient Discussions on the Likelihood of Prostate-Specific Antigen Testing

Louie E. Ross, PhD; Lisa C. Richardson, MD, MPH; and Zahava Berkowitz, MSPH, MSc Atlanta, Georgia

The findings and conclusions in this report are those of the author(s) and do not necessarily represent the views of the Centers for Disease Control and Prevention.

Many medical and professional organizations agree that men should discuss the advantages and disadvantages of testing for prostate-specific antigen (PSA) with their physicians before undergoing testing. In the 2000 National Health Interview Survey, men who had undergone a PSA test in the past were asked about their use of this test and discussions they had with physicians regarding its advantages and disadvantages. Among a group of 2,188 black and white men aged 40-79 years with no history of prostate cancer and a history of testing for PSA, we examined whether physician-patient discussions mediated the relationship between race and PSA testing. We specified that the test had to be their most recent one and part of a routine physical examination or screening test. We compared those tested within the past two years with those tested >2 years. Almost two-thirds of the men previously had discussions with their physicians about the advantages and disadvantages of the PSA test. Older men, college graduates, those living in the midwest and those with health insurance were more likely to have been tested recently. Discussion with a physician was found to mediate the relationship between race and PSA testing during the past two years. Black men were initially found to be more likely than white men to have been screened recently [odds ratio (OR)=1.45; 95% confidence interval (CI) 1.01-2.07], but in the full model race was no longer significant (OR=1.41; 95% CI 0.98-2.03). Discussions about PSA testing were associated with more recent PSA screening (OR=1.38, 95% CI 1.05–1.82). These findings suggest that: 1) the relationships among race, physician discussions and PSA testing may need to be examined in more complex ways, and 2) the physician has an important role in men's decision to consider PSA testing.

Key words: prostate cancer ■ PSA test use ■ mediation ■ screening

© 2006. From Epidemiology and Applied Research Branch, Division of Cancer Prevention and Control, National Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention, Atlanta, GA. Send correspondence and reprint requests for J Natl Med Assoc. 2006;98:1823–1829 to: Dr. Louie E. Ross, National Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention, 4770 Buford Highway NE, MS K-55, Atlanta, GA 30341; phone: (770) 488-3087; fax: (770) 488-4759; e-mail: Ior3@cdc.gov

INTRODUCTION

Prostate cancer is the most common (nonskin) cancer in men. In 2006, over 234,000 new cases will be diagnosed, and >27,000 deaths are expected to occur.¹ African-American men have about a 60% higher incidence and more than twice the mortality rates of white men, while Asian-American/Pacific-Islander, American-Indian/Alaska-Native and Hispanic/Latino men have incidence and mortality rates lower than those of white men.¹

Screening recommendations for prostate cancer vary among medical groups and professional organizations.² For example, the American Cancer Society and the American Urological Association suggest that men be offered the prostate-specific antigen (PSA) test and the digital rectal examination (DRE) at age 50 or earlier if they are at high risk for developing prostate cancer, as are African-American men and men with first-degree relatives diagnosed with prostate cancer.^{1,3} Other organizations such as the U.S. Preventive Services Task Force, the American Academy of Family Physicians, the American College of Physicians, and the American College of Preventive Medicine have concluded that studies have not yet proven that screening for prostate cancer saves lives.² Therefore, these groups have decided that either routine screening should not be performed or that evidence is insufficient to offer a recommendation for or against screening.^{2,4} This variability in recommendations is likely to cause confusion among men and perhaps their physicians, who may wonder whether to recommend screening and, if so, who should get a recommendation.

In contrast, there is agreement among various organizations that men should be given information about the benefits and limitations of screening and have discussions with their physicians so that they can make a shared or informed decision about screening.² Most national medical and patient organizations recommend involving the patient in screening decision-making.²

Studies that have explored racial differences in PSA test use have produced mixed findings—black men more likely than whites to be tested,⁵ white men more likely than blacks,⁶ and no racial difference.^{7.9} Studies also report few discussions with patients.^{5.6} At present, however, there is some evidence that advice or recommendations from physicians or having a regular source of care is associated with higher levels of PSA testing.^{5.8-12} These studies also report that sociodemographic variables, i.e., older men (age), men with higher levels of education and



income, married men, men with some type of health insurance, men with a family history of prostate cancer, men with fair or poor health statuses, men with several chronic diseases, and those men with a usual source of care are related to greater PSA test use.⁸⁹

Researchers commonly examine specific factors to see how they mediate the relationship between an independent variable and a dependent variable or outcome. A variable may function as a mediator when it accounts for the relationship between an independent variable and a dependent variable. A mediator variable articulates why or how the relationship occurs.¹³ Mediation is demonstrated when control for the proposed mediator reduces the association between the independent and dependent variables, suggesting that the relationship or effect between the independent and dependent variables is in part or completely influenced by the mediator.¹³⁻¹⁶ Earlier findings noted that physician discussions positively influenced testing among black men who had undergone a PSA test in the past year.¹⁷ Authors wanted to investigate whether this model supported mediation, moderation or neither when black and white men were combined into the same sample.

The purpose of this analysis was to clarify the relationship between race and recent PSA test use. Because almost all medical groups and organizations suggest that physicians discuss the benefits and limitations of PSA testing with their male patients, it is important to understand the role of such discussions on rates of PSA screening. More specifically, how do these discussions influence the relationship between race and PSA testing when controlling for other variables that have been shown in the literature to be associated with use of the PSA test?

METHODS

The National Health Interview Survey (NHIS) is conducted each year by the National Center for Health Statistics. The survey includes core questions about the respondent's health, demographic and socioeconomic status, and use of health services. In 2000, information was collected on cancer prevention and control, and the survey contained questions specifically related to prostate cancer test use and screening.¹⁸ One sample adult was randomly selected as a respondent from each family participating in the NHIS. African-American and Hispanic households were oversampled to obtain moreprecise estimates and to allow comparisons among several racial and ethnic groups.¹⁸

Study Population

Interviews were conducted with 32,374 adults. Of this group, 6,195 were black or white men aged 40–79 years old with no history of prostate cancer. For step-by-step exclusions, see Figure 1. Of the 6,195 men, 2,541 had undergone a PSA test. The question, "Did the doctor dis-

cuss the advantages and disadvantages of the PSA test before doing it?," was asked specifically to men about their most recent PSA test. Our final analysis included a subpopulation of 2,188 non-Hispanic black and white

Table 1. Sample size and estimated percentages of the population for characteristics of black and white men aged 40 to 79 years with no history of prostate pancer and a psa test as part of a routine physical examination/screening

Variable	Total N*=2,188					
	N*	% †	95% CI			
Demographics						
Age (Years)						
40-49	383	18.8	16.8–21.1			
50-64	1,004	47.3	44.8-49.8			
65–79	801	33.9	31.3–36.5			
Marital Status						
Married/member of an unmarried couple	1.503	80.9	79.3-82.4			
Divorced/separated	346	9.8	8.6-11.1			
Widowed	164	4.4	3.7-5.1			
Never been married	173	5.0	4.2-5.9			
Education		0.0				
<pre><high pre="" school<=""></high></pre>	305	13.0	116-146			
High-school graduate	600	28.5	26 2-30 8			
Some college	540	20.0	20.2 00.0			
College graduate	495	32.8	30 4-35 1			
Porcontago of Eddoral Povorty Loval	0/5	52.0	50.0-55.1			
	202	124	100 141			
	303	12.4	10.7-14.1			
200-499%	643 (01	20.7	20.7-31.0			
≥300%	071	32.0	30.5-35.1			
	166	25.9	23.8-28.2			
Race/Ethnicity	1 000	<u> </u>	07.0.01.0			
Non-Hispanic White	1,888	89.6	87.9-91.0			
Non-Hispanic black	300	10.4	9.0-12.1			
Region						
Northeast	436	20.6	18.4-22.8			
Midwest	552	25.5	23.7-27.5			
South	833	38.1	35.6-40.6			
West	367	15.8	14.2–17.6			
Reside in a Metropolitan Statistical Area						
Yes	1,717	78.1	76.0-80.1			
No	471	21.9	19.9–24.0			
Access to Healthcare						
Health Coverage						
Yes	2,094	96.5	95.5–97.3			
No	85	3.5	2.7-4.5			
Physician-Discussed PSA						
Yes	1,403	64.8	62.6–66.9			
No	729	35.2	33.1-37.4			
Health Status						
General Health						
Excellent	527	25.6	23.6-27.8			
Very good	714	33.2	30.9-35.5			
Good	598	26.6	24.5-28.8			
Fair/poor	327	14.6	13.0-16.5			
Cancer in the Family	02/					
Yes	174	83	7.0-9.7			
No	1 981	917	90 3-92 9			
	1,701	71.7	/0.0 /2./			
PSA within 2 years	1 202	82.2	81 5-85 0			
$PS\Delta in >2$ voors	373	14 7	150-185			
I JA III - 2 YOUIS	505	10.7	10.0-10.0			

Numbers in table may differ from totals due to reporting of don't know, refused or missing; * Sample size; † % A weighted estimate for U.S. population in the group described. The weighted estimates are representative of the U.S. population in 2000. Percentages may not add to 100 because of rounding.

men aged 40–79 years with no history of prostate cancer who had their most recent PSA test as part of a routine physical examination for screening purposes only and not for other reasons. The overall response rate in the adult sample of 32,734 persons was 72.1%.¹⁷

DATA COLLECTION

We constructed a variable to indicate whether men had received their most recent PSA test within the past two years versus >2 years ago. We examined selected demographic (age, race, level of education, marital status, etc.) and other variables as covariates that had been identified in the literature as being associated with PSA test use. More detailed information on these variables is published elsewhere.^{8,9} Specific variables and their attributes are shown in Table 1.

DATA ANALYSIS

The NHIS 2000 release used a complex sample design involving stratification, clustering and multistage sampling. Sample weights were constructed to reflect the standard population of the United States in 2000.¹⁸ The Survey Data Analysis statistical computer package (SUDAAN) was used for the analysis.¹⁹ whether there are racial differences in discussions with patients in PSA test use, and 2) assess whether such discussions mediate the effects of race on whether men have had a recent screening PSA test (versus such a screening test >2 years ago). We use the mediation model based on the seminal work of Baron and Kinney (Figure 2).¹³

To test mediation, independent (X), dependent (Y) and mediator (Z) variables may be categorical or continuous.¹³ In our analysis, we used a categorical independent variable (race, non-Hispanic black and white men), a dichotomous dependent variable (whether or not men had undergone a PSA screening test in the past two years) and a categorical mediator (physician discussions of their most recent test—yes or no) (Figure 2). A model is said to be fully mediated if the relationship between the predictor and outcome variable changes from significant to nonsignificant when the mediator is entered into the model.¹³

We used logistic regression to explore the relationships in four models that included the following: 1) race (X) as the independent variable, physician discussion (Z) as the mediator and PSA within past two years (Y) as the dependent variable. The four models were: 1) race and physician discussion $(X \rightarrow Z)$; 2) physician discussion and screening PSA within the past two years $(Z \rightarrow Y)$; 3)

The overall goals of this analysis were to: 1) explore

Table 2. Odds ratios with 95% confidence intervals for mediation model of physician discussion and having a psa screening test within the past two years

Model	Model 1. X→Z		Model 2. Z→Y PSA Test in Past 2 Years		Model 3. X→Y			Model 4. X→Y Z PSA Test in Past 2 Years				
Outcome Variable [‡]	Physician Discussions				PSA Test in Past 2 Years							
	OR	95% CI	p†	OR	95% CI	p†	OR	95% CI	p†	OR	95% CI	p [†]
Race			0.034						0.043			0.063
Non-Hispanic whites	1.00						1.00			1.00		
Non-Hispanic blacks	1.45	1.03-2.04					1.45	1.01-2.07		1.41	0.98-2.03	
Physician's Discussion						0.023						0.028
No				1.00						1.00		
Yes				1.38	1.05-1.82					1.36	1.03-1.80	
Age (Years)			0.945			0.004			0.002			0.003
40-49	1.00	1.00	1.00	1.00								
5064	0.99	0.75-1.32	0.946	1.46	1.06-2.02	0.022	1.52	1.11-2.09	0.010	1.50	1.08-2.08	0.016
65–79	1.03	0.77–1.38	0.852	1.92	1.30-2.82	0.001	1.93	1.33-2.80	0.001	1.99	1.34-2.96	0.001
Education			0.567			0.002			0.001			0.001
< College graduate	1.00			1.00			1.00			1.00		
College graduate	0.93	0.74–1.18		1.64	1.20-2.23		1.66	1.22-2.26		1.68	1.23-2.30	
Region			0.368			0.054			0.046			0.054
Northeast	1.00			1.00			1.00			1.00		
Midwest	0.95	0.71–1.27	0.725	1.52	1.05-2.20	0.026	1.46	1.01–2.10	0.043	1.55	1.07-2.23	0.020
South	1.10	0.84–1.45	0.492	1.39	0.96-2.01	0.081	1.35	0.93–1.94	0.111	1.36	0.94-1.96	0.100
West	0.86	0.62-1.20	0.377	1.02	0.69-1.52	0.907	0.95	0.65–1.40	0.803	1.04	0.70-1.54	0.854
Health Insurance Cove	rage		0.367			< 0.001			< 0.001			< 0.001
Not covered	1.00			1.00			1.00			1.00		
Covered	0.78	0.45-1.34		3.48	2.16-5.61		3.47	2.14-5.62		3.55	2.20-5.70	

effect where the number of levels is >2 are based on the tast don't levels within a main difference of levels within a main difference of levels is >2 are based on the tast; Grid: Model 1. $X \rightarrow Z$ (race and physician discussion); Model 2. $Z \rightarrow Y$ (physician discussions and screening PSA in 2 years); Model 3. $X \rightarrow Y$ (race and screening PSA in 2 years); Model 4. $X \rightarrow Y$ (race and screening PSA in 2 years); Model 4. $X \rightarrow Y$ (race and screening PSA in 2 years); Model 4. $X \rightarrow Y$ (race and screening PSA in 2 years); Model 4. $X \rightarrow Y$ (race and screening PSA in 2 years); Model 4. $X \rightarrow Y$ (race and screening PSA in 2 years); Model 4. $X \rightarrow Y$ (race and screening PSA in 2 years); Model 4. $X \rightarrow Y$ (race and screening PSA in 2 years); Model 4. $X \rightarrow Y$ (race and screening PSA in 2 years); Model 4. $X \rightarrow Y$ (race and screening PSA in 2 years); Model 4. $X \rightarrow Y$ (race and screening PSA in 2 years); Model 4. $X \rightarrow Y$ (race and screening PSA in 2 years); Model 4. $X \rightarrow Y$ (race and screening PSA in 2 years); Model 4. $X \rightarrow Y$ (race and screening PSA in 2 years); Model 4. $X \rightarrow Y$ (race and screening PSA in 2 years); Model 4. $X \rightarrow Y$ (race and screening PSA in 2 years); Model 4. $X \rightarrow Y$ (race and screening PSA in 2 years); Model 4. $X \rightarrow Y$ (race and screening PSA in 2 years); Model 4. $X \rightarrow Y$ (race and screening PSA in 2 years); Model 4. $X \rightarrow Y$ (race and screening PSA in 2 years); Model 4. $X \rightarrow Y$ (race and screening PSA in 2 years); Model 4. $X \rightarrow Y$ (race and screening PSA in 2 years); Model 4. $X \rightarrow Y$ (race and screening PSA in 2 years); Model 4. $X \rightarrow Y$ (race and screening PSA in 2 years); Model 4. $X \rightarrow Y$ (race and screening PSA in 2 years); Model 4. $X \rightarrow Y$ (race and screening PSA in 2 years); Model 4. $X \rightarrow Y$ (race and screening PSA in 2 years); Model 4. $X \rightarrow Y$ (race and screening PSA in 2 years); Model 4. $X \rightarrow Y$ (race and screening PSA in 2 years); Model 4. $X \rightarrow Y$ (race and screening PSA in 2 years); Model 4. $X \rightarrow Y$ (race and screening PSA in 2 years); Model 4. $X \rightarrow Y$ (race and screening PSA in 2 years); Model 4. $X \rightarrow Y$

race and screening PSA within the past two years minus the effect of physician discussions $(X \rightarrow Y)$; and 4) race and screening PSA within the past two years, including physician-patient discussion $(X \rightarrow Y \parallel Z)$. Variables used as model covariates are shown in Table 1.

We used the Wald F test to assess the overall statistical significance of each covariate in the four models. General linear contrasts were used to assess statistical differences when comparisons were made to a reference level within a variable. We presented the most parsimonious model by including only those variables that were significant (p<0.05). Therefore, the final model includes race, age (in years), level of education, region, health insurance coverage and physician discussion (Table 2).

RESULTS

The sample characteristics of black and white men aged 40–79 years in the United States who had ever had a PSA test (as part of a routine physical examination or screening) are shown in Table 1. These men were predominantly white (90%), married or living with a partner (81%), and covered by health insurance coverage (97%). Eighty-three percent of the population had received a PSA test within two years, and 65% had discussions with their physicians about the advantages and disadvantages of their most recent PSA test.

To examine the association between race and having had a screening PSA test in the past two years, while taking into account the mediating influence of having discussed the test with a physician, four logistic regression analyses were performed (Table 2). In model 1, black men were found to be more likely than white men to have had discussions with their physicians controlling for all other variables in the model. Model 2, which does not include race, physician discussions (the mediating factor) were associated with an increased likelihood of receiving a recent PSA test. In model 3, we found that black men were more likely to have had a recent PSA test than white men when the effect of physician discussions is excluded. When race and physician discussions were evaluated in the same model (model 4), the association between race and having had a recent PSA test was reduced. The odds that black men had a recent screening PSA test compared with the odds for white men was reduced from 1.45 to 1.41, and race was no longer statistically significant (p=0.063). The five variables that remained significant in model 4 were physician discussions (OR=1.36, CI 1.03–1.80), being \geq 50 years, being a college graduate, residing in the midwest (northeast as referent) and having health insurance.

Our results are consistent with mediation (Figure 2). We found that race was related to the mediating variable (physician discussions) (model 1, $X \rightarrow Z$), that physician discussion was related to our outcome variable (screening PSA test in the past two years) when race was not considered (model 2, $Z \rightarrow Y$), that race was related to the outcome when physician discussion was not considered (model 3, $X \rightarrow Y$), and that when race and physician discussions were considered simultaneously (model 4, $X \rightarrow Y$), the original relationship between race and outcome was attenuated and no longer significant (although a difference between black and white men still existed).

DISCUSSION

Findings that older men, college graduates and the insured were relatively more likely to have been tested recently are consistent with associations described in more detail in other studies.^{8,9}

Since most medical organizations encourage physician discussion, it is vital to know whether physicians are having reasonably detailed discussions with their



patients about matters of importance to them (e.g., the PSA test for men). It is also essential to know whether such discussions influence PSA testing practices. This study, which was based on self-reported data, found that nearly two-thirds of men who had undergone the PSA test had a discussion beforehand with their physician about the advantages and disadvantages of the PSA test. This finding may be related to the new emphasis placed on physician-patient discussions by the major medical groups and professional organizations.² However, our results found that black men were more likely than white men to have had a physician discussion about the PSA test. In a more recent study based in North Carolina, Stark and colleagues reported that 42% of white and 36% of black men said their physicians discussed screening in the past year.²⁰ Comparing our findings with these other studies is difficult to do; however, we included only those men who had undergone a screening PSA test, while the others included all men who reported PSA test use for any purpose.^{6,20} A second issue to consider is that the question about physician-patient discussions may have been asked differently on different surveys.

Current practice standards, healthcare guidelines and professional organizations recommend that physicians have discussions with their patients on the benefits and limitations of PSA testing. The American Cancer Society and the American Urological Association suggest that African-American men be offered the screening tests at earlier ages based on their increased risk of developing prostate cancer.^{1,3} Others believe that the evidence is insufficient to endorse routine screening of anyone for prostate cancer.² The U.S. Preventive Services Task Force says that if early detection improves health outcomes, then men aged 50–70 who are at average risk and men ≥45 years who are at increased risk (African-American men and those with a first-degree relative with prostate cancer) are most likely to benefit from screening.⁴ Our results provide more information on the correlates of PSA testing but illustrate that the relationship between race and PSA test use is complex. More comprehensive models, such as the mediation model presented in this study, should be investigated in future research. Discussions with physicians have been linked to increased PSA screening in previous studies,^{5,10,11} and our findings are in accord with this research.

The mediation model is used more commonly in the social psychological literature than in studies of health services utilization (such as use of a screening test). Perhaps some of the earlier literature on the contribution of race and ethnicity to the performance of PSA testing was influenced by the effects of physicians' discussions with these men.²¹

This study has several limitations. The first is the reliance on self-reports of test use. Self-reports should be interpreted with caution,²² especially if they are about

the PSA test. Men may underestimate the amount of time since their last PSA test or they may not remember being tested at all.²³ Blood samples are taken for numerous reasons, and oftentimes these tests are not discussed with patients. In addition, misreporting can also vary by social and personal characteristics that could lead to bias in accuracy of PSA test use.^{24,25}

Another limitation to the present study is the possible bias in the question, "Did your doctor discuss the advantages and disadvantages of this test with you before giving it?" Many physicians may not discuss the advantages and disadvantages equally. This question suggests an evenhanded approach, but that may not be the case. Studies also tend to suggest that physicians often frame the discussion to match their beliefs and experiences about PSA testing, and some physician discussions center around encouraging men to have the test.^{21,26} The respondents in the NHIS may have answered differently if they were asked whether their physicians discussed mainly the advantages (one question) or mainly the disadvantages (a separate question).

We should note that we still know little or nothing about the information physicians provide to men, how much information they provide, how much time they spend with them, the context of the discussions and whether these discussions are appropriately balanced. Dunn and coworkers reported that physicians may not fully engage patients in meaningful discussions related to prostate cancer and screening with the PSA test because they lack time, the topic is too complex, they lack knowledge about the benefits and risks of PSA screening, or other reasons.²⁶ We know that physicians' biases play a role in whether PSA testing is offered but, in the present study, we were unable to address physicians' motivations for discussing this testing.

Because the focus of this paper was to test mediation, we did not run separate analysis by race in our study. The difference in PSA test use for screening purposes between black and white men decreased somewhat when physician discussions were introduced. In another study (using NHIS 2000) with blacks only, physician discussions increased greatly the likelihood of PSA testing for black men.¹⁷ The likely pattern is that the association of physician discussions with race is stronger for blacks than for whites.

Finally, in the current study, the initial sample size of 6,195 was reduced by about two-thirds—as many men from the initial sample were excluded because they had never had ≥ 1 routine/screening PSA test. Whether this reduction in numbers influenced our findings was not explored.

This study also has several strengths. We used the NHIS, a large national survey which oversampled African-American men, allowing more precise estimates of factors that might explain PSA test use among these men. The data were collected in a manner to allow for comparisons across two racial groups. We also used

a simple model to explain differences in PSA test use for screening purposes. We asked men whether their physicians discussed the advantages and disadvantages of the PSA test before ordering it for their most recent screening PSA test only to add clarity to both the appropriate discussion and test. Since most men had several tests, this served to reduce ambiguity or confusion.

The present study may encourage other researchers to inquire into the nature of the discussions physicians have with their patients, which would increase our knowledge about an important component of patient care that to date has been relatively neglected, especially in the area of prostate cancer. Future studies should explore the context and extent of these discussions, e.g., are they cursory or more detailed, and do they engage the patient in the actual decision to undergo screening, etc? These future studies might also examine: 1) whether physicians are using shared or informed decision-making processes; 2) whether physicians are framing the discussions to influence men's choices about PSA screening to reflect the physicians' beliefs about screening; and 3) whether culture, race/ethnicity, social class or differences in language affect how physicians and patients interact when discussing important issues such as screening for cancer. These types of explorations might further clarify the role of physician discussions in the use of PSA testing and whether that test is actually conducted.

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