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# Social Ecological Predictors of Prostate-Specific Antigen Blood Test and Digital Rectal Examination in Black American Men

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**Disclaimer:** The terms *African Americans* and *blacks* are used interchangeably because many people continue to refer to themselves in this manner. The terms represent Americans of African descent.

**Background:** Black American men continue to suffer disproportionately from epidemically higher rates of prostate cancer. We hypothesize that complex reasons for persistently higher death rates of prostate cancer in this group are steeped in social factors associated with health access.

**Methods:** We utilized data from the It's All About U prostate cancer prevention study among black men to investigate: 1) what social ecological factors were predictive of prostate-specific antigen (PSA) testing and digital rectal examinations (DRE); 2) if black men were aware of prostate cancer screening and, if screening was available, would they take the PSA and DRE? Quantitative cross-sectional data from a cohort of 276 black men with no diagnosis of prostate cancer were analyzed to identify characteristics, beliefs, practices and attitudes of this group toward prostate cancer screening. We created a social ecological model to examine which social factors (i.e., environmental, personal, person/environment interplay, black culture and institutional policy) were predictive of PSA and DRE, PSA only and DRE only. To reduce data and identify data patterns, factor analyses (tested for reliability by calculating Cronbach alpha scores) were performed. Variables were standardized with Z scores and analyzed with predictive analytic software technology (SPSS, version 12). A multivariate binary logistic regression was conducted to identify predictors of PSA and DRE.

**Results:** A significant predictor of both PSA and DRE was the physician's direct prostate cancer communication message ( $P < 0.010$ ). Significant correlations exist in PSA and DRE outcomes with a physician's engaging communication style

( $P < 0.012$ ), encouragement to screen ( $P < 0.001$ ) and sharing prostate cancer information ( $P < 0.001$ ); as was men understanding the serious risk of prostate cancer ( $P < 0.001$ ), culture ( $P < 0.004$ ), positive interaction with healthcare staff, significant other(s) and providers ( $P < 0.001$ ), and environmental dimensions ( $P < 0.006$ ). A profile of four major self-reported barriers to screening were identified (i.e., fear, internal locus of health, comfort level and external locus of health). Lastly, men who utilized health systems with a prostate cancer screening policy had high percentages of PSA and DRE (63.3%), PSA only (70.9%) and DRE only (81.7%).

**Conclusion:** A physician's aggressive, positive engagement in shared decision-making, tailored social influences promoting prostate cancer prevention among black men, as well as institutional screening policy, has the potential to increase early detection and reduce morbidity among this group.

**Key words:** prostate cancer ■ prevention ■ policy ■ social ecology ■ African Americans ■ men's health

© 2006. From School of Public Health (Woods, assistant professor of research; Montgomery, associate dean of academic affairs and director, Center for Health Research; Herring, associate professor of health promotion and education, and director, Black Recruitment for Adventist Health Study-2) and Office of Institutional Research and Planning, Graduate School (Gardner, director), Loma Linda University, Loma Linda, CA; and Department of Planning, Policy and Design, University of California in Irvine, School of Social Ecology, Irvine, CA (Stokols, professor). Send correspondence and reprint requests for *J Natl Med Assoc.* 2006;98:492-504 to: Dr. V. Diane Woods, Assistant Professor of Research, Loma Linda University, School of Public Health, 11139 Poplar St., #A, Loma Linda, CA 92354; phone: (909) 558-8384; fax: (909) 558-4087; e-mail: vwoods@llu.edu

## BACKGROUND

Even though the trend is changing for some groups, black American men continue to suffer disproportionately from epidemically higher rates of prostate cancer than any other racial or ethnic group in the world.<sup>1,2</sup> In 2001, the overall age-adjusted death rate in the United States from prostate cancer was 29.1 per 100,000.<sup>3</sup> Among non-Hispanic black males, the age-adjusted death rate was 66.1 per 100,000, and among non-His-

panic white males, the rate was 26.2 per 100,000.<sup>3</sup> According to the American Cancer Society (ACS),<sup>4</sup> in 2003, approximately 1.3 million Americans were diagnosed with invasive cancer. Black American men had a 20% higher incidence rate and a 40% higher death rate than white men from all cancers combined. In the 2003 annual report to the nation on the status of cancer from 1996–2000, the incidence of prostate cancer for blacks was 272.1 per 100,000; whites, 164.3 per 100,000; Hispanics, 137.2 per 100,000; Asians/Pacific Islanders, 100.0 per 100,000; and American Indians/Alaska Natives, 53.6 per 100,000.<sup>5</sup> The mortality rates in California for prostate cancer are similar to the national trends. From 1995–1999, the average annual age-adjusted mortality rate in California for prostate cancer deaths among black men was 58.9 per 100,000; for whites 29.3 per 100,000; and 19.4, 13.6, 9.5 per 100,000 for Hispanic, Asian/Pacific Islander and American Indian/Alaska Native men respectively.<sup>6</sup> In San Bernardino County, CA, the 1999 age-adjusted prostate cancer mortality rate for black males was almost three times (93.7 per 100,000) greater than white males, 32.6 per 100,000.<sup>7</sup> Current trend data continues to show high rates. Higher death rates are associated with late detection and health access;<sup>4</sup> however; it is not clear as to why.

### Prostate Cancer Early Detection Access

Detection and prevention of any disease pathology is related to healthcare provider access.<sup>8</sup> Access to care involves the ability to obtain needed, affordable, convenient, acceptable and effective personal health services in a timely manner.<sup>9</sup> In other words, access to healthcare requires individuals to have a place to go, a healthcare provider to see them, resources to obtain proper care and the appropriate health services given in an appropriate timeframe. Evidence is overwhelming that among racial and ethnic minorities in the United States, blacks receive lower quality of healthcare than nonminorities.<sup>10</sup> With respect to late detection of prostate cancer in black men, access to early detection activities is a major concern.

In 1999, Isaac J. Powell, MD,<sup>11</sup> speaking at a clinical congress for the American College of Surgeons, presented data demonstrating that when organ-confined cancer is being treated, there is little difference in recurrence rates between African-American men (2.0%) and American Caucasian men (5.7%). However, African-American men have a worse recurrence rate (42.0%), compared to Caucasians (24.9%,  $P=0.001$ ) when the disease is detected later and is locally advanced. Late detection is a serious access issue. Other issues critical to early detection access and decisions for screening are the lack of clarity

and consensus among medical and professional groups regarding recommended screening and early detection guidelines.<sup>12,13</sup>

### Prostate Cancer Screening Recommendations

In asymptomatic populations, screening remains the most common method for early detection of disease. Within the medical profession, there is a lack of consensus regarding prostate cancer early detection guidelines.<sup>14</sup> There is little evidence that current prostate cancer screening guidelines sufficiently take into account the different and more aggressive disease presentation of this cancer in black men.<sup>12,13</sup> The U.S. Prevention Services Task Force (USPSTF) has concluded there is insufficient evidence for or against routine screening for prostate cancer using prostate-specific antigen (PSA) blood test or the digital rectal exam (DRE).<sup>15</sup> The USPSTF indicates it is unclear how early detection improves health outcomes but good evidence does exist that PSA screening can detect early-stage prostate cancer.<sup>16</sup> Additionally, the National Cancer Institute (NCI) states there is insufficient evidence that prostate cancer mortality can be reduced by early detection and screening methods.<sup>17</sup> Both the American Academy of Family Physicians (AAFP)<sup>18</sup> and the American College of Physicians (ACP)<sup>19</sup> agree there is insufficient evidence for or against routine screening with PSA and DRE. Even though the American College of Preventive Medicine (ACPM) is against routine population screening with PSA or DRE, they recommend screening for men age  $\geq 50$  years with a life expectancy of 10 years be given information and consult with their physician.<sup>20</sup> It is not clear that studies on which these recommendations are based include sufficient numbers of black men despite the fact that they have the highest disease burden of all ethnic and racial groups.

Conversely, recommended guidelines of the ACS<sup>21</sup> are that men at high risk (e.g., family history, black) should begin early detection with PSA blood test and the DRE at age 45 years. Furthermore, ACS guidelines suggest that the decision for high-risk men to be tested should be made within the physician/patient relationship. The American Urological Association (AUA) recommends that men at high risk (African-American men) begin testing at age 45 years, with additional recommendations for higher-risk men (men with multiple first-degree relatives with prostate cancer) to begin testing at age 40 years.<sup>22</sup>

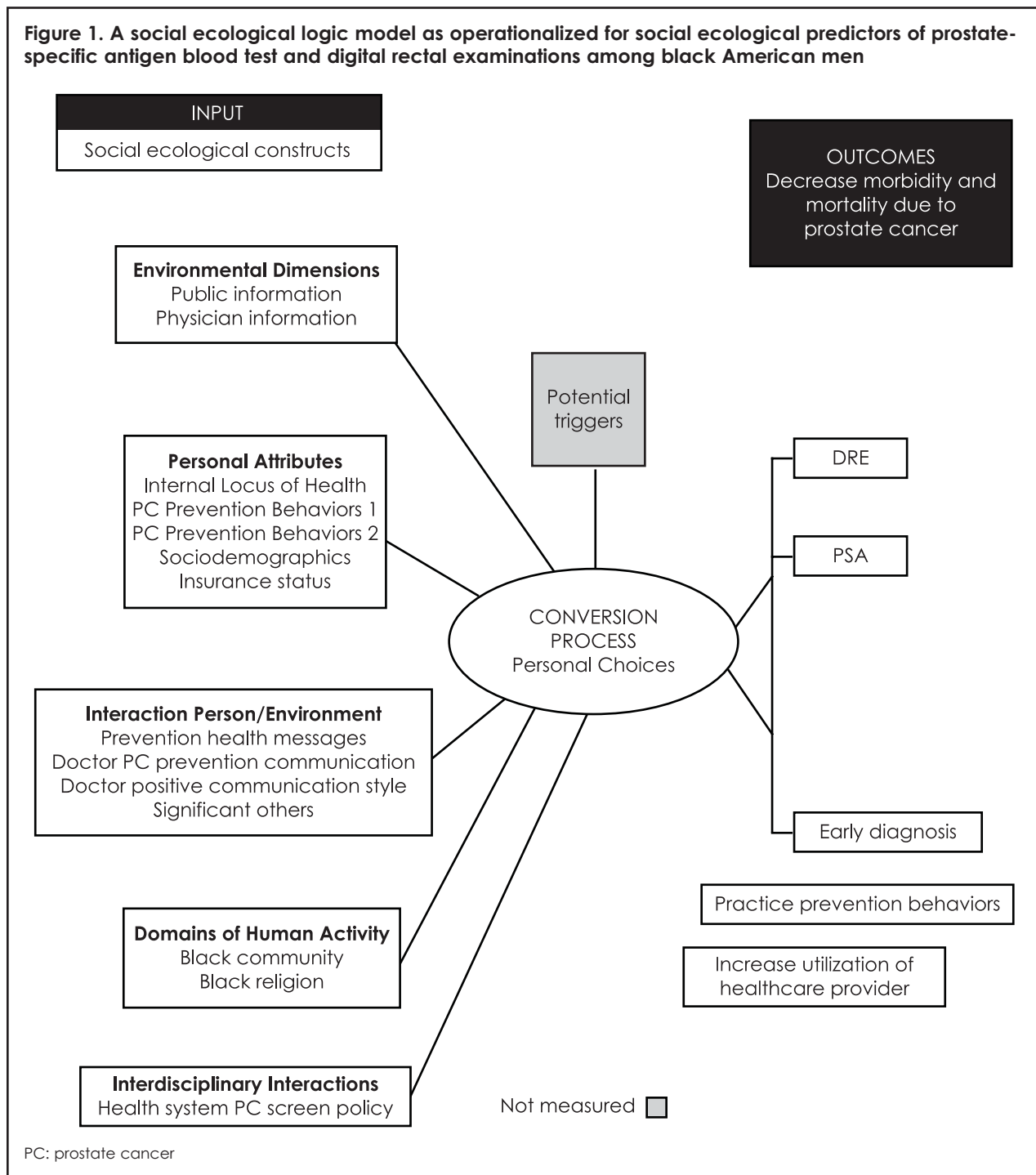
More black American men are diagnosed with advanced-stage prostate cancer (where the cancer has spread from the primary tumor site into distant organs, tissues or lymph nodes) than white men at a rate of 3:1. This seemingly nonaggressive approach

toward the epidemic of prostate cancer in black men is complicated by the lack of agreement on preventive testing by the major medical review groups. Without medical consensus, missed opportunities to address this epidemic are pervasive. Too little screening of black men is occurring which increases the possibility of not detecting prostate cancer in its early stage in this at-risk population.

## Black Men and Prostate Cancer Prevention

In the absence of a consensus and incentives to screen the most vulnerable population for prostate cancer, the epidemic situation among black men continues to increase. Decreasing prostate cancer among this group is further complicated by their own prevention behaviors. Historically, black men are less likely than other male groups or females to seek healthcare and participate in health-related activities, such as

**Figure 1. A social ecological logic model as operationalized for social ecological predictors of prostate-specific antigen blood test and digital rectal examinations among black American men**



preventive and self-care practices.<sup>17</sup>

Traditional barriers given for black males' lack of participation in prevention activities generally relate to lack of health insurance, not going to a physician on a regular basis, lack of transportation and lack of interest in their health.<sup>23-25</sup> It is not clear if these traditional barriers are major factors in prostate cancer early detection. However, it is known that delay in seeking healthcare places black men at higher risk for nonparticipation in prostate cancer early detection and screening.

The NIH tracks participation of minorities in research to ensure studies rule out significant differences in people groups and to provide unbiased assessments and outcomes. According to the NIH comprehensive report<sup>26</sup> on tracking human subject research, limited data are available on blacks. For fiscal year 2004, NIH reported 8.9% of all subjects in national clinical research were blacks/African Americans; 4.0% were black males. Additionally, the report identifies fear and distrust of research, lack of knowledge and transportation, interference with work and family responsibilities, participation burden and financial cost as consistent barriers for low participation among minorities. To understand the complexity of this dilemma related to prostate cancer early detection requires examination of multiple levels of influence.

## Social Ecological Theoretical Framework

Social ecology encompasses a broad, multidisciplinary perspective in understanding the relationship between people and their environment, which allows for investigation of multiple levels of influence on behavior.<sup>27,28</sup> Theoretical emphasis of a social ecological framework is on social, institutional and cultural contexts of people-environmental relationships. Core concepts of a social ecological framework involve human interaction in multiple settings, generally described as five spheres of influence on health outcomes (i.e., physical health status, developmental maturation, social cohesion):<sup>28</sup> 1) the environmental domain (such as multiple physical, social, cultural dimensions); 2) personal attributes (i.e., genetics, psychological disposition, behavioral patterns); 3) the dynamic interdependent relations between people and their environment (e.g., negative and positive feedback, homeostasis factors); 4) the interdependence of environmental conditions within multiple settings (i.e., neighborhoods, workplace, personal residence) and life domains (i.e., individual, family, groups); and 5) the interdisciplinary approach to assessing the healthfulness of settings and the well-being of persons and groups.

The goal of this paper is to examine social ecological factors as an explanatory framework for

**Table 1. Reliability analysis with Cronbach alpha scores of each construct subscale in the Social Ecological Logic model for predictors of prostate-specific antigen blood test and digital rectal examinations among black American men, N=276**

Social Ecological Construct Subscales	Number of Variables	Cronbach Alpha Scores
<i>Construct #1: Environmental Dimensions</i>		
Public information	1	NA
Physician information	2	0.664
<i>Construct #2: Personal Attributes</i>		
Internal locus of health	7	0.692
Prostate Cancer Prevention Behavior 1	2	0.799
Prostate Cancer Prevention Behavior 2	2	0.628
<i>Construct #3: Interaction Person/Environment</i>		
Prevention health messages	4	0.764
Physician prostate cancer prevention communication	6	0.923
Physician positive communication style	6	0.829
Significant others	1	NA
<i>Construct #4: Domain of Human Activity</i>		
Black community	5	0.733
Black religion	3	0.638
<i>Construct #5: Interdisciplinary Interaction</i>		
Health system prostate cancer screen policy	1	NA

PC Prevention Behavior 1: physician-inspired; PC Prevention Behavior 2: self-initiated; NA: Not applicable, factors with one variable cannot be calculated



black males' lack of obtaining prostate cancer prevention screening with the PSA blood test and the DRE. For the purposes of this paper, prostate cancer prevention screening will refer to PSA blood testing and DRE. We investigated characteristics, attitudes, practices and beliefs of black men related to prostate cancer screening. We hypothesized if black men were aware of the need for prostate cancer screening and, if the screening was available, they would take the PSA and/or DRE. To examine this hypothesis, we created a social ecological logic model (Figure 1) to assess influences of multiple ecological factors on black men's decisions to take the PSA and/or DRE.

## METHODS

### Study Design

For this study, we used cross-sectional quantitative data from the black male questionnaire of a 2001 CDC-funded Prostate Cancer Prevention Behaviors Among African American Men study, the It's All About U project.<sup>29</sup> We explored social ecological factors that were predictive of black men's access to and participation in PSA blood testing and DRE. To analyze data, we created and operationalized a social ecological logic model based on factors identified by the study group. To create the model constructs, we used a priori hypotheses to identify variables from the black male questionnaire associated with the model core assumptions. Each construct subscale variable was then tested for reliability by calculating Cronbach alpha scores. These social ecological variables (SEV) were further analyzed for statistical significance related to PSA and DRE outcomes.

### Sample

The study sample consisted of a cohort of 276 non-Hispanic black males in San Bernardino County. Our total, N=276, included 11 (4.0%) respondents age <40 years and 265 (96.0%) >40 years. We targeted non-Hispanic black males age >40 years; however, we retained those <40 for comparisons of results. Other inclusion criteria included no diagnoses of prostate cancer or any evidence of drug abuse, impaired cognitive ability or mental illness. The participants were asked to complete a 160-question, self-administered questionnaire that measured their knowledge, attitudes, beliefs, practices, culture and personal characteristics.<sup>30</sup>

Convenience purposive sampling techniques were employed to recruit participants from two focused areas—health facilities or predominately black communities.<sup>31</sup> Health facility sites included a university-associated private medical center, a large regional county medical center and a Veterans'

Administration medical facility, including their outpatient family or medical clinics, or physician's offices. Community sites included the Masonic lodges, the Elks lodge, a fraternity, the American Legion, churches, community meetings, businesses, walk-ins into the research center or call-ins requesting to participate. Exclusion criteria for participant recruitment included not living in the defined geographical region of the study.

Recruitment strategies included advertisement posters and brochures strategically placed in a clearly visible location in the lobby of each health facility or clinic, and examining rooms where the primary care provider would visit male patients. Health facility recruitment involved staff asking potential participants to sign a contact form for the research staff to follow-up by phone to make interview appointments, in addition to research staff stationed on-site for immediate face-to-face surveying. Community recruitment involved word-of-mouth contacts. Research staff made follow-up phone calls for appointments at convenient locations suggested by the potential participant, e.g., clinic lobby, homes, worksites, community group meetings, business meetings or social clubs. A cash monetary incentive of \$15 was offered to each participant who completed the questionnaire.

### Measures by Social Ecological Variables

Our dependent variables were PSA only, DRE only, and PSA and DRE combined outcomes. Each dependent variable was measured as a dichotomous outcome (yes or no). Independent social ecological variables consisted of five constructs: 1) environmental dimensions, 2) personal attributes, 3) interaction between person/environment, 4) multiple domains of human activity, and 5) health system prostate cancer screening policy. Figure 1 is a schematic of our social ecological logic model operationalized to measure influences of these five constructs on black men and PSA and DRE outcomes. Scales of measurements varied to include Likert-type scales with responses generally coded as strongly disagree = 1, somewhat disagree = 2, "I'm not certain" = 3, somewhat agree = 4 and strongly agree = 5; nominal scales and dichotomous responses (no = 1 and yes = 2).

Social ecological variable #1 (SEV #1) measured the influence of methods of communicating information such as newspapers, television, radio, posters, flyers and brochures. This variable had two subscales: Public Information (e.g., TV, radio, posters, etc.) and Physician Information. Physician Information consisted of brochures or handouts given to the patient by the physician. The Public Information variable was measured on a five-point Lik-

ert-type scale. Physician Information was measured on a nominal scale with dichotomous responses.

SEV #2 measured personal attributes such as sociodemographics, medical history, preventive behaviors, and cognitive and psychological representations of health and illness. Three subscales were included in this variable: Internal Locus of Health (cognitive and psychological representations of health) measured on a five-point Likert-type scale; Prostate Cancer Prevention Behavior 1 (direct physician-inspired screening—after talking with personal physician about screening, had PSA or DRE) measured on a nominal scale with dichotomous responses; and Prostate Cancer Prevention Behavior 2 (self-initiated appointment for screening) measured on a nominal scale with four option responses.

SEV #3 included relationships between the person and the environment which measured the influence of significant others, i.e., family, friends, healthcare professionals. There were four subscales in this variable: Physician Health Messages (general information discussed about healthy lifestyle), Physician Prostate Cancer Prevention Communication (discussions about risk, benefits, and the need for PSA and DRE), Physician Positive Communication Style (engaging in conversation about health and encouragement to ask questions), and Significant Others. All responses were measured on a five-point Likert-type scale, except Doctor Prostate Cancer Prevention Communication, which was a nominal scale with dichotomous responses.

SEV #4 was developed to identify multiple

**Table 2. Background characteristics of black male sample, N=276**

Description	Response Category	n	Percent
Mean age=52.96 (SD=9.772)			
Age groups (years)	<40	11	4.0
	40–49	98	35.5
	50–59	104	37.7
	≥60	63	22.9
Race/ethnicity <sup>a</sup>	African-American	187	67.8
	Black	61	22.1
Marital Status	Married	147	53.3
Education	<12th grade	39	14.1
	12th grade/GED/tech school	85	30.7
	Some college	114	41.3
	Graduate/professional school	38	13.8
Total annual income	<\$20,000	108	39.1
	\$20,000–\$39,999	49	17.7
	\$40,000–\$59,999	48	17.7
	≥60,000	52	18.8
Own home	Yes	130	47.1
Personal automobile	Yes	217	78.6
Health insurance	Yes	219	79.3
Health insurance type <sup>b</sup>	Private	84	30.4
	HMO	60	21.7
	Medicare/Medicaid	60	21.7
	VA	42	15.2
	Other	41	14.9
PC screening status <sup>c</sup>	PSA done	126	45.7
	DRE done	169	61.2
	PSA + DRE done	106	38.4

Percentages do not add up to 100%, no responses and missing data not included. a: self-identification; b: Respondents checked more than one choice; c: PC is prostate cancer (PSA: prostate-specific antigen blood test; DRE: digital rectal exam)

domains of human activity that involved black community mentors, leaders, social clubs, business associates and religion. Two subscales were identified: Black Community (symbolic representation of black culture, such as friends, music and associations), and Black Religion (symbolic representation of the church, i.e., gospel music, black church influence and membership in a black church), which were both measured on Likert-type scales.

Finally, SEV #5 represented the institution's screening policy. This variable was created to measure the effect of a health system screening policy on prostate cancer screening outcomes. We created an independent health system screening policy variable by assigning each facility from where men were recruited to a yes or no category. Each male could then be identified with an institution with or without a prostate cancer screening policy. Responses were measured on a nominal scale: "yes" if the institution had a prostate cancer screening policy, or "no" if the institution did not have a prostate cancer screening policy.

### Data Analysis

Analyses were conducted using multiple statistical analytical methods with predictive analytic software technology, the SPSS version 12 for Windows® (SPSS Inc., Chicago, IL).

Data were screened for outliers and missing values. Descriptive analyses were performed with frequency distributions to determine a profile of the sample population, characteristics, attitudes, practices and beliefs of black men related to prostate cancer screening. Bivariate analyses with cross-tabulations and Chi-squared tests of significance were performed on each independent social ecological variable against PSA only, DRE only, and both PSA and DRE outcomes.

To reduce data, confirmatory factor analyses were conducted by calculating Cronbach alpha scores on each construct subscale. The closer the Cronbach alpha was to 1.00, the greater the internal consistency

of variables within the subscale. No scores appeared for subscales with only one variable because Cronbach alpha scores could not be calculated. See Table 1 for reliability analysis of construct sub-scales with Cronbach alpha scores. For standardization of measurement scales, all variables were converted to Z scores and used for data analyses.

We conducted bivariate correlations with each construct subscale Z scores using Pearson's correlation coefficient to test the significance of the independent variables related to the outcome variables. Two-tailed tests were performed to determine the direction of the relationships. All tests were conducted at 0.05 significant level. A multivariate logistic regression analysis was performed on the model constructs using the block procedure. Constructs 1–5 were entered as one block to determine the significance of the entire social ecological model on PSA only, DRE only, and both PSA and DRE outcomes. Another multivariate regression model was created with subscales entered in as one block model to determine which scale was predictive of screening outcomes among black men.

### RESULTS

#### Sample Description

The majority of participants, n=146 (52.9%), were recruited from community sites, i.e., the Masonic lodges: 46 (16.6%), walk-ins: 31 (11.6%), churches: 24 (8.7%), the American legion: 16 (5.8%), the Elks Lodge: 13 (4.7%), a fraternity: eight (2.9%) and a black business club: eight (2.9%). The remaining participants, n=130 (47.1%) were from health facility sites, i.e., five (1.8%) from the university-associated private medical center, 119 (43.1%) from the large regional county medical center and six (2.2%) from the Veterans' Administration medical facility. One-hundred-thirty (47.1%) of the study participants were recruited from the health facility where they received services. Regarding

**Table 3. Bivariate correlation analyses with Spearman's Rho coefficients of economics and prostate-specific antigen blood test and digital rectal examination outcomes among black American men, N=276**

Economics	Prostate Cancer Screening Status					
	PSA Done (n=126)		DRE Done (n=169)		PSA and DRE Done (n=106)	
	Rho Coefficient	Sig.	Rho Coefficient	Sig.	Rho Coefficient	Sig.
Total income	0.337**	0.001	0.337**	0.001	0.346**	0.001
Health insurance	0.192**	0.003	0.277**	0.001	0.207**	0.001
<i>Health Insurance Type</i>						
Private	0.084	0.197	-0.136*	0.025	0.044	0.463
Medicare/Medicaid	-0.034	0.603	-0.015	0.801	-0.017	0.775
VA	-0.146*	0.024	-0.115	0.058	-0.184**	0.002
HMO	-0.239**	0.001	-0.127*	0.037	-0.234**	0.001

\* Correlation is significant at the 0.05 level (two-tailed); \*\* Correlation is significant at the 0.01 level (two-tailed).



health facility prostate cancer screening policy, the university medical center and the VA had a “yes” screening policy— $n=11$  respondents from both institutions—and the county medical center had a “no” screening policy— $n=119$  respondents.

The mean age was 53 years, ( $SD=9.772$ ). One-hundred-sixty-nine (61.2%) had a DRE, 126 (45.7%) had a PSA, and 106 (38.4%) had both the PSA and DRE. In the age group 40–49, 74.1% ( $n=63$ ) never had a PSA and 53.6% ( $n=52$ ) never had a DRE. Of those 11 men who were in the age group <39 years, two reported they had a PSA, five had a DRE, and one had both the PSA and DRE. Men in the age group 50–59 had the most PSAs:  $n=58$  (63.7%), and DREs:  $n=70$  (68.0%). However, 34.1% of the men in this age group reported never taking a PSA or DRE. In fact, 11 (10.0%) of the men >60 years had not taken a DRE or PSA.

Overall, nearly 80% of the sample had some type of health coverage, mostly private (30.4%), HMO (21.7%) or Medicare/Medicaid (21.7%). Eighty-six percent were educated beyond the 12th grade. The majority (54.3%) had an annual household income of >\$20,000. Forty-seven percent were home owners, 78.6% had a personal automobile and 53.3% were married. Table 2 is a demographic profile of study participants.

## Economics and PSA/DRE Outcomes

Table 3 displays the bivariate correlation analyses of economics and PSA/DRE outcomes in the study sample. There is a highly significant association across all three outcomes (PSA only, DRE only, and both PSA and DRE) between income levels and having health insurance coverage. A total of 102 (37.6%) men indicated they never had a DRE, of which 66.0% had some type of health insurance. Of the 112 (47.1%) men who never had a PSA, 74.1% had some type of health insurance. VA ( $Rho=-0.184$ ,  $P<0.002$ ) and HMO ( $Rho=-0.234$ ,  $P<0.001$ ) insurance types had a highly statistically significant negative association with men having both PSA and DRE. The majority of men who had a HMO insurance type had PSA only (74.5%), DRE only (74.1%), and both PSA/DRE (60.0%). Other health insurance types had lower percentages of screening compared to HMOs for both PSA and DRE, private insurance (41.7%) and Medicare/Medicaid (40.0%). That is approximately a 20% difference in screenings of men with HMO insurance compared to other types of insurance. With PSA only and DRE only, the difference was approximately 10–15%.

## Attitudes and Beliefs toward Prostate Cancer Screening

Many respondents believed prostate cancer could be detected early by using certain medical tests

**Table 4. Barriers to obtaining prostate cancer screening as identified by black American men, N=276**

Description	n	Percent
<i>Fear</i>		
Afraid to deal with cancer-related problems	220	79.7
Afraid of cancer treatment	219	79.3
Afraid of sexual side effects of cancer treatment	219	79.3
Afraid of having surgery	211	76.4
Afraid of finding out they have cancer	207	75.0
<i>Internal Locus of Health</i>		
Not aware need to be screened	213	77.2
Do not go to doctor for routine check-ups	212	76.8
Do not think at-risk	203	73.6
Do not have a regular doctor	202	73.2
Do not have any problems	196	71.0
Do not have health insurance	196	71.0
It does not matter, an African-American male will get it anyway	194	70.3
<i>Comfort Level</i>		
Uncomfortable with rectal exams	208	75.4
Uncomfortable talking about this cancer with significant others	187	67.8
<i>External Locus of Health</i>		
Doctor never explained should have prostate cancer screen	184	66.7
Doctor never mentioned having a prostate cancer screen	172	62.3
Do not know a place to be screened	168	60.9

Percentages do not add up to 100%; no responses and missing data not included

(84.4%), and through signs and symptoms, i.e., difficulty urinating (75.4%), blood in the urine (67.8%) and weak urine flow (67.8%). Additionally, 65.6% believed that prostate cancer screening was a routine part of medical care. Nearly all (92%) believed early detection improves life. Regarding risk for prostate cancer, 67.0% of the respondents believed that all men could develop prostate cancer.

### Self-Reported Barriers to Prostate Cancer Screening

There were four categories of responses where black men identified barriers to obtaining prostate cancer screening: 1) fear, 2) internal locus of health, 3) comfort level, and 4) external locus of health (Table 4). The majority of respondents identified fear-related barriers such as fear of cancer problems (79.7%), fear of cancer treatment (79.3%), fear of sexual dysfunctions (79.3%) and fear of a cancer diagnosis (75.0%). Barriers related to internal locus of control toward health included a lack of awareness for the need to be screened (77.2%), not going to the doctor (76.8%), denial of self-risk (73.6%) and a fatalistic perspective toward prostate cancer (70.3%). Men were also uncomfortable in taking the rectal exam (75.4%). To a lesser degree, men identified external barriers related to physician interac-

tion, such as the physician did not explain to him the need for screening (66.7%) and that the physician did not actually tell him to have the PSA test or the DRE (62.3%).

### Social Ecological Predictors

Table 5 displays bivariate correlations between the model construct subscales and prostate cancer screening outcomes. Within each subscale, there were significant associations between the social ecological variable and PSA only, DRE only, and PSA and DRE combined outcomes.

**PSA and DRE.** There was a direct positive relationship between physician engaging the black male in conversation about a decision for prostate cancer screening (PC Prevention Behavior 1,  $P < 0.001$ ), doctor's positive encouragement to be screened (Doctor PC Prevention Communication,  $P < 0.001$ , Doctor Positive Communication Style,  $P < 0.012$ , Physician Information,  $P < 0.001$ ) and health information (Public Information,  $P < 0.006$ , Preventive Health Messages,  $P < 0.001$ ) on having both the PSA and DRE. Internal locus on health ( $P = 0.391$ ), significant others ( $P = 0.099$ ) and black religion ( $P = 0.298$ ) had no statistical significance on men having PSA and DRE combined. The black community ( $r = -0.178$ ,  $P < 0.004$ ) and the health system prostate can-

**Table 5. Bivariate correlation analyses of the Social Ecological Construct subscale standardized Z score variables on prostate-specific antigen blood test and digital rectal examination outcomes on black American men, N=276**

Social Ecological Construct Subscales	Prostate Cancer Screening Status					
	PSA (n=126)		DRE (n=169)		PSA and DRE (n=106)	
	Pearson's r	Sig.	Pearson's r	Sig.	Pearson's r	Sig.
<i>Construct #1: Environmental Dimensions</i>						
Public information	0.129*	0.049	0.168**	0.007	0.171**	0.006
Physician information	0.159*	0.015	0.176**	0.004	0.221**	0.001
<i>Construct #2: Personal Attributes</i>						
Internal Locus of Health	-0.013	0.841	0.067	0.279	0.040	0.519
PC Prevention Behavior 1	0.528**	0.001	0.465**	0.001	0.583**	0.001
PC Prevention Behavior 2	-0.104	0.168	-0.345**	0.001	-0.241**	0.001
<i>Construct #3: Interaction Person/Environment</i>						
Prevention health messages	0.200**	0.002	0.254**	0.001	0.211**	0.001
Doctor PC prevention communication	0.349**	0.001	0.353**	0.001	0.449**	0.001
Doctor positive communication style	0.143*	0.031	0.085	0.175	0.155*	0.012
Significant others	0.122	0.064	0.009	0.885	0.046	0.456
<i>Construct #4: Domain of Human Activity</i>						
Black community	-0.103	0.118	-0.201**	0.001	-0.178**	0.004
Black religion	0.031	0.642	0.015	0.803	0.024	0.695
<i>Construct #5: Interdisciplinary Interaction</i>						
Health system PC screening policy	-0.244**	0.008	-0.178*	0.044	-0.284**	0.001

\*Correlation is significant at the 0.05 level (two-tailed); \*\* Correlation is significant at the 0.01 level (two-tailed)

cer screening policy ( $r=-0.284$ ,  $P<0.001$ ) had a statistically significant negative impact on PSA/DRE outcomes. All correlations were significant at 0.01 level, except for the Doctor Positive Communication Style (significant at 0.05 level).

In our study, 79.3% had some type of health insurance, 78.6% had an annual check-up within the last 12 months (89.1% within the last 24 months), 76% indicated they had a primary doctor for healthcare and 78.6% had a personal automobile. Interest in their health is indicative of the fact that nearly 90% went to their healthcare provider annually for a regular physical examination, and 76% indicated they had their own medical doctor. Of those in the 39–49-year-old age group who were in for their check-up in the last 12 months, 78.8% had not been told to have a PSA, and 75.8% had not been told to have a DRE. In the 50–59-year-old age group, 55.3% had not been told to have a PSA, and 69.7% had not been told to have a DRE. Given these findings, examining social influences provide a greater understanding of factors predictive of PSA and DRE outcomes.

**PSA only.** As a single outcome, PSA was only associated with the physician actually giving information about prostate cancer screening to the black male ( $P<0.015$ ), and general information in the newspaper,

on the radio, TV or brochures about prostate cancer screening ( $P<0.049$ ). In addition, general health messages from the physician (Prevention Health Messages,  $P<0.002$ ) and specific prostate cancer information about risk, benefits and need for test (Doctor PC Prevention Communication,  $P<0.001$ ), as well as the physicians' positive communication style ( $P<0.031$ ), were strongly associated with having PSA only outcomes. The health system screening policy had a statistically significant negative association on PSA only outcomes ( $r=-0.244$ ,  $P<0.008$ ).

**DRE only.** The DRE had the same statistically significant responses as the PSA, except for the doctors' communication style. Doctor's communication style had no statistically significant association with black men having the DRE ( $P=0.175$ ). However, the black male initiating a routine prostate cancer screening ( $r=-0.345$ ,  $P<0.001$ ) was highly negatively associated with him having the DRE. The black community had a similarly significant negative effect ( $r=-0.201$ ,  $P<0.001$ ), as well as the health system screening policy ( $r=-0.178$ ,  $P<0.044$ ).

**Predictors.** Multivariate binary logistic regression analysis is displayed in Table 6. When considering all social influences (constructs 1–5) in the regression model, the most statistically significant

**Table 6. Multivariate binary logistic regression analysis of the Social Ecological Construct subscale standardized Z-score variables as predictors of prostate-specific antigen blood test and digital rectal examination outcomes on black American men, N=276**

Social Ecological Construct Subscales	Prostate Cancer Screening Status					
	PSA (n=126)		DRE (n=169)		PSA and DRE (n=106)	
	Pearson's r	Sig.	Pearson's r	Sig.	Pearson's r	Sig.
<i>Construct #1: Environmental Dimensions</i>						
Public information	-0.145	0.537	0.082	0.720	0.015	0.952]
Physician information	0.607	0.155	1.555*	0.051	0.927	0.068
	-0.875	0.072	-0.706	0.299	-0.474	0.305
<i>Construct #2: Personal Attributes</i>	[0.574*	0.025	0.477*	0.038	0.528*	0.051]
Internal Locus of Health	-1.067	0.074	-0.448	0.609	-0.606	0.391
PC Prevention Behavior 1	1.137*	0.012	1.635	0.059	1.100*	0.010
PC Prevention Behavior 2	-0.086	0.798	-1.716**	0.005	-0.619	0.151
<i>Construct #3: Interaction Person/Environment</i>	[0.644*	0.020	0.756*	0.011	0.773**	0.007]
Prevention health messages	-0.602	0.360	0.508	0.636	0.103	0.891
Doctor PC prevention communication	0.198	0.368	-0.662	0.105	0.107	0.609
Doctor positive communication style	0.567	0.303	-2.061	0.081	0.782	0.182
Significant others	-0.208	0.624	-0.916	0.173	-0.872	0.099
<i>Construct #4: Domain of Human Activity</i>	[-0.154	0.466	-0.449*	0.020	-0.451	0.056]
Black community	-0.257	0.571	-1.135	0.118	-0.508	0.276
Black religion	-0.277	0.522	-0.561	0.375	-0.495	0.298
<i>Construct #5: Interdisciplinary Interaction</i>	[-0.303	0.172	-0.143	0.564	-0.324	0.122]
Health system PC screening policy	-0.737	0.098	-0.862	0.175	-0.443	0.205

\* significant at 0.05 level; \*\* significant at 0.01 level; PC Prevention Behavior 1: physician-inspired; PC Prevention Behavior 2: self-initiated; PCP: prostate cancer prevention; Pos: positive; PCS: prostate cancer screening; [ ]: All constructs as a model were regressed on the dependent variable using the block method

predictor of black men having both the PSA and DRE was the doctor discussing the need for prostate cancer screening. This was measured in Construct #2: Subscale—PC Prevention Behavior 1 ( $P < 0.010$ ). After the doctor's discussion, the man indicated he went in for a PSA or DRE screening. In addition, this variable was predictive of PSA only,  $P < 0.012$ , and DRE only,  $P < 0.059$  (borderline effect). There was a strong association with prostate cancer screening when a man had a clear understanding for the need and when the physician explained the need to him. PC Prevention Behavior 1 subscale had a Cronbach alpha score of 0.799.

Two other significant predictors for DRE only were public information about prostate cancer prevention ( $r = 1.555$ ,  $P < 0.051$  [borderline effect]) and self-initiated prostate cancer screening with a routine physical, a prostate exam or prostate problem, [PC Prevention Behavior 2, ( $r = -1.716$ ,  $P < 0.005$ )]. In addition to engaging the black male in understanding the need to be tested for prostate cancer and an environment with specific information to reinforce the need, there was a strong association with screening even when men in our study expressed a preference not to have the DRE. However, most men in the study had a DRE (61.2%) as opposed to a PSA (45.7%).

## DISCUSSION

We believe that the negative influence of the black community upon PSA and DRE outcomes is more likely due to fear. Nearly 80% of the men clearly expressed fear of cancer, cancer-related problems and side effects of cancer treatments. Fear is more than likely a major barrier to prostate cancer screening for black men. By heritage, blacks are a very social group. Within the black community, there is a negative perception regarding healthcare that may be reflected in low participation in screening activities. This negative perception is perhaps based in part on distrust and fear of the healthcare system, which is rooted historically in mistreatment of blacks by healthcare professionals (i.e., the experiments at Tuskegee).<sup>33,34</sup> Similarly, we observed a negative effect with black men initiating a routine prostate cancer screening with the DRE. Men expressed they simply "did not like the rectal exam."

Conversely, there was a strong positive association between the physicians' relationship with their black male patients and the decision to have a PSA or DRE. We observed that the more engaging the physician was towards black men in discussing prostate cancer screening and giving them specific information about prostate cancer, the more likely the black male would participate in screening. Dosa,<sup>11</sup> Royal et al.,<sup>24</sup> Nivens et al.,<sup>35</sup> and Street et al.,<sup>36</sup> documented physician-patient relations on pos-

itive health outcomes in similar research. Even though 75.4% of the men indicated they were uncomfortable having a rectal exam, they were aware that the DRE ("the finger") was the examination by the physician to check for prostate cancer, and they took the exam because it was medically indicated. Additionally, 61.2% reported taking the DRE compared to the PSA (45.7%) even though they expressed a dislike for the DRE.

Furthermore, traditional barriers generally found in the literature regarding black men and late healthcare access (i.e., lack of health insurance, not going to physician on a regular basis, lack of transportation and not interested in their health) were not the findings of our study. We had a representative sample of black men from low-, middle- and upper-income levels as well as various health systems and health insurance coverage types. Even though nearly 40% reported a total annual income of  $< \$20,000$ , only 14% reported not completing the 12th grade. Our group was educated, with low economic status, but accessed preventive services. Nearly 80% had some type of health insurance and reported having PSA and DRE screenings in facilities where the health system policy did not support screening. The public health system in our study did not have a prostate cancer screening policy. However, 20.2% of the men who utilized the public health system had both the PSA and DRE, 29.2% had a PSA only, and 50% had a DRE only. This is indicative that black men were engaged in screening.

In addition, men who utilize health systems with a prostate cancer screen policy had a higher percentage of PSA and DRE (63.3%), PSA only (70.9%), and DRE only (81.7%). As we had hypothesized, black men had prostate cancer screening when they were aware of the need and when it was available to them. The negative association on PSA-only outcomes related to the health system variable was probably due to polarized responses. In health systems with a prostate cancer screen policy, 11 men had the PSA, compared to systems *without* a prostate cancer screen policy where 119 men had the PSA. The variance in number of responses probably contributed to the instability of the results of the analyses.

Clearly, physician's aggressive, positive engagement in shared decision-making is highly predictive of black men making an informed decision to have the PSA and DRE (Construct #2—PC Prevention Behavior 1,  $P < 0.010$ ). This is similar to findings by Krupat et al.,<sup>37</sup> and Kravitz and Melnikow.<sup>38</sup> When the physician's engagement is surrounded by social influences promoting a clear prostate cancer prevention message targeting black men, there is a strong possibility he will participate in screening. We conclude, therefore, that complex social factors related to his physical environment, personal attributes and



interactions are determinates of prostate cancer prevention in black men. These factors are associated with tailored communications, the physician's direct communication message about prostate cancer screening, black American community culture, and having a health system screening policy, in addition to the black male's knowledge about prostate cancer, fear and distrust of the healthcare system. Incorporating interventions to positively affect these multiple factors will likely improve appropriate access to detection of early stage prostate cancer and hopefully decrease death rates among black men.

Finally, regarding the limitations of this study, first, the original survey instrument was not designed based on the social ecological framework of this study, which limited the construct subscale definition. However, in the original study, a validation focus group was conducted to determine the reliability of the language content, issues under study and mode of administration. Secondly, there is an inherent bias in self-reported data. The men in this study may not have accurately recalled participating in prostate cancer screening, and medical record data was not available to validate screening test. Third, the sample size was skewed toward the health system with a no-screen policy limiting generalizations related to institutional screening policies. Therefore, a larger sample size is needed for further investigation. Outside of the health system data analysis, statistical power was maintained, and type-2 error was not a concern.

Early diagnosis decreases the possibility for advanced stage diagnosis and greatly improves the probability for higher prostate cancer survival rates depending on the cancer stage at diagnosis. Our study findings are critical due to the average age (53 years) of our participants. Black men are the most at-risk group for prostate cancer and should be routinely screened much earlier than their white counterparts, who are generally expected to be screened at age 50 years.<sup>2</sup> Certainly, early-stage diagnosis can offer the possibility of a better quality of life. Institutional policy changes are needed for more aggressive screening among black men in order to reduce existing health disparities and decrease morbidity and mortality due to late-stage diagnosis. Likewise, we believe ethical medical practices demand aggressive approaches when a sustained disease pattern with fatal outcomes is epidemic among subpopulations, such as with the persistently high death rates from prostate cancer among black American men.

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