RESEARCH

Perceived Behavioral Control regarding Prostate Cancer Screening among Black Men in West Africa and the United States

Motolani E. Ogunsanya[1,18*], Iya Eze Bassey[2,18], Mohammed Faruk[3,18], Catherine Oladoyinbo[4,18], Haruna Nggada[5,18], Abidemi Omonisi[6,18], Nissa Askins[7,18], Blaise Nkegoum[8,18], Ademola A. Popoola[9,18], Iheanyi Okpala[10,18], Omolara Fatiregun[11,18], Paul Jibrin[12,18], Emeka E. Iweala[13,18], Wole Kukoyi[14,18], Kayode Adeniji[15,18], Ayo Salako[16,18], Anthonia Sowunmii[17,18], Folakemi T. Odedina[7,18]

Authors' Affiliations:
[*1]College of Pharmacy, University of Oklahoma Health Sciences Center, Oklahoma City, OK 73117, USA
[2]Department of Medical Laboratory Science, College of Medical Sciences, University of Calabar, Calabar, Cross River State, Nigeria
[3]Department of Pathology, College of Health Sciences, Faculty of Basic Clinical Sciences, Ahmadu Bello University, Zaria, Nigeria
[4]Department of Nutrition and Dietetics, Federal University of Agriculture, Abeokuta, Ogun State, Nigeria
[5]Department of Pathology, University of Maiduguri, Nigeria
[6]Department of Anatomic Pathology, Ekiti State University, Nigeria
[7]Department of Pharmacotherapy and Translational Research and Department of Radiation Oncology, University of Florida, Lake Nona Campus, FL, 32832, USA
[8]Department of Anatomy and Pathology, University of Yaoundé Teaching Hospital, Cameroon
[9]Department of Surgery, University of Ilorin Teaching Hospital, Ilorin, Nigeria
[10]College of Medicine, University of Nigeria, Enugu, Nigeria
[11]Department of Radiology, Oncology Unit, Lagos State University Teaching Hospital, Ikeja, Nigeria
[12]Department of Pathology, National Hospital, Abuja, Nigeria
[13]Department of Biochemistry, Covenant University, Ota, Nigeria
[14]Ace Medicare Clinics Limited, Ota, Ogun State, Nigeria
[15]Department of Pathology, Faculty of Basic Medical Sciences, University of Ilorin Teaching Hospital, Ilorin, Nigeria[16]Urology Unit, Obafemi Awolowo University, Ife, Nigeria
[17]Department of Radiotherapy and Oncology, Lagos University Teaching Hospital, Idi-Araba, Nigeria
[18]Prostate Cancer Transatlantic Consortium (CaPTC)

Corresponding author: Motolani Ogunsanya, email: Motolani-ogunsanya@ouhsc.edu

ABSTRACT

To examine how perceived behavioral control (PBC) is affected by sociodemographic and behavioral factors, employing a socio-ecologic approach, and identify the relative importance of these factors. This was a cross-sectional, correlational study of 500 Black men from the Prostate Cancer Transatlantic Consortium (CaPTC) familial project. A survey using standardized CaPTC and other measures collected information on intrapersonal (e.g., age, knowledge), interpersonal (e.g., cues to action, social support), and institutional factors (e.g., informed decision) that are predictive of PBC. Black male participants, aged between 35-70 years, were recruited from the US, Nigeria, and Cameroon. Descriptive statistics (mean, SD, and frequency) were calculated for all variables, and multiple regression was employed to determine significant ($p<0.05$) predictors of PBC. Data were analyzed using SPSS v24. Participants had an average age of 48±10 years, a low level of knowledge (mean=10.31±3.66; range 0-20), encountered very low cues to action (mean=1.60±2.13; range 0-13), had usual levels of social support (2.41±1.24), and were mostly (96.4%) not counseled on the advantages and disadvantages of prostate cancer screening. Attitude, knowledge, informed decision, and prostate cancer information seeking behavior were significant predictors, and the overall model accounted for 49% ($p < 0.01$) of the variation in PBC. Using a socio-ecologic approach, multi-level factors were integrated to facilitate a fuller understanding of the several factors impacting PBC in Black men. The four significant factors (attitude, knowledge, informed decision, and prostate cancer information seeking behavior knowledge) could be considered when developing culturally-sensitive interventions aimed at engaging at-risk Black men regarding prostate cancer prevention and early detection practices.

KEYWORDS: Prostate cancer, young Black men, theoretical model, prevention, screening, health disparity

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INTRODUCTION

Prostate cancer has become the leading cancer in males of Black ancestry (2016). Black men are more likely to have a diagnosis of prostate cancer at an early age, a higher grade and stage prostate cancer present with complications and therefore have higher rates of morbidity and mortality compared to other races and ethnicities (Shenoy et al., 2016). This disparity in morbidity and mortality has been attributed to some factors including biological differences in different ethnic groups as well as limited access to preventive care (Odedina et al., 2009). Positive family history has also been found to be a significant risk factor for prostate cancer (Sanchez et al., 2007).

Globally, Jamaican men of African descent, as well as African-American men, are known to have the highest incidence of prostate cancer (Odedina et al., 2009; Rebbeck et al., 2013). Compared to Caucasian men, the risk of developing prostate cancer in Black men based purely on ethnicity is estimated to be 40 to 80% higher (Eeles et al., 2014). Survival rates comparing Black men with Caucasian men show a clear disparity (White et al., 2011). The risk of developing prostate cancer is higher in families with a history of the disease than in the general population (Tourville and Nguyen, 2013). Inherited susceptibility appears to play an additional independent role in the development of prostate cancer. Men diagnosed with prostate cancer are almost twice as likely to have a male blood relative (brother or father especially) who has been diagnosed with prostate cancer (Ibrayev et al., 2013; Murthy et al., 2011) In addition, prostate cancer risk increases with an increasing number of affected family members, such that men with two or three first degree relatives affected have a five- and eleven-fold increased risk of developing prostate cancer, respectively (Scher et al., 2015).

A major factor responsible for this disparity in morbidity and mortality is that Black men are less likely to get preventive care, such as prostate cancer screening when needed. Several studies reveal that even after adjusting for socioeconomic status, comorbidities, and access to care, Black men are less likely to undergo prostate cancer screening (Consedine et al., 2006; Lehto et al., 2010; Winterich et al., 2009b). Other factors that have been associated with lower prostate cancer screening include lack of prostate cancer knowledge, lower perceived risk and susceptibility to prostate cancer, and poor physician recommendation (Drake et al., 2010; Gonzalez et al., 2008; Ogunsanya et al., 2016c).

Perceived behavioral control (PBC) has been defined as one's perception of their ability to perform a given behavior (Ajzen, 1985). PBC also refers to the degree of ease or difficulty of performing the behavior of interest, and is determined by the power of both situational and internal factors that might enable or hinder the individual from enacting the behavior (Ajzen, 1991; Ajzen and Fischbein, 2005). PBC has been shown to be an important precursor of engaging in cancer preventative behaviors, such as breast cancer screening (Baron-Epel, 2009; Steele and Porche, 2005; Tolma et al., 2014). It is important to assess an individual's perceived control over resources and skills necessary for engaging in the future behavior. In addition, PBC is also assumed to be dependent on past experiences as well as *perceived* barriers and obstacles to prostate cancer screening (Odedina et al., 2011b). In addition, men who perceive themselves to be in control of their health are more likely to engage in cancer

reduction behaviors such as prostate cancer screening (Niederdeppe and Levy, 2007).

To reduce the prostate cancer disparity gaps in morbidity and mortality in Black men and increase screening practices in at-risk men, culturally-sensitive interventions are needed. The likelihood of the success of such intervention will rely on examining behavioral change theories that identify motivations to partake in recommended health behaviors (Fishbein and Ajzen, 1975; Hennessy et al., 2014b; Riley et al., 2011). Central to behavior change theories lies the assumptions that health interventions influence behavior through a series of influence, such as knowledge levels, beliefs, attitudes, PBC, which then impacts behavior (Bellcross et al., 2011; Busse and Miranda, 2018; Hennessy et al., 2014a; Trivers et al., 2011).

Moreover, cues to action can also serve as a driver in modifying health behaviors. Cues to action can also be derived from intrinsic or extrinsic factors. Intrinsically, a positive family history of prostate cancer has been reported to serve as an influential source of prostate cancer information among family members (Nivens et al., 2001; Ogunsanya et al., 2016a). Outside of the family, health care providers remain the most trusted source of health information (Hesse et al., 2010; Ogunsanya et al., 2016c). However, studies have reported lower rates of physician-patient discussion regarding prostate cancer in Black men (Mitchell, 2011; Winterich et al., 2009a). Regardless of the level with which prostate cancer communication occurs, other factors such as age, education, attitudes, education levels, may further impact PBC over prostate cancer and screening.

A handful of studies have been conducted in Black men to assess their beliefs regarding prostate cancer screening (Odedina et al., 2011b; Ogunsanya et al., 2016b; Oliver, 2007). However, since these studies were conducted in US Black men only, it would be interesting also to explore these beliefs in native African populations and ethnically-diverse Black men who may be genetically similar but differ in lifestyle, behavior, cultural beliefs, and values. In addition, this is the first study, to our knowledge, examining the impact of PBC and its correlates over prostate cancer screening. Also, the effects of PBC on a target behavior have been reported to be the most impactful in modifying behaviors (Madden et al., 1992).

Therefore, the goal of the present research is to examine how PBC is affected by sociodemographic and behavioral factors, employing a socio-ecologic approach in Black men from West Africa and the United States. This proposal seeks to frame intrapersonal and contextual (interpersonal and institutional) that might influence Black men's PBC regarding prostate cancer and screening, and identify the relative importance of those factors.

Furthermore, a comprehensive understanding of the determinants of this primary outcome could inform the development of culturally appropriate interventions that might improve prostate cancer screening participation in men at the highest risk.

METHODS

This was a cross-sectional, correlational study designed to recruit 500 Black men from the Prostate Cancer Transatlantic Consortium (CaPTC) familial project over one year. Data was extracted using standardized CaPTC and other validated measures that collected information on intrapersonal (e.g., age, knowledge), interpersonal (e.g., cues to action, social support), and

institutional factors (e.g., informed decision-making) which are predictive of perceived behavioral control (PBC). The study inclusion criteria were: (i) Black men in Nigeria, Cameroon and the US, regardless of history of prostate cancer diagnosis, between the age of 35 and 70 recruited at clinics, health forums and in the community; (ii) men who consented to completing the study survey; and (iv) men willing to provide consent to access their medical records for clinical annotations (for those recruited at clinics).

Study Variables

Dependent Variable

Perceived Behavioral Control (PBC)

In accordance with Ajzen (Ajzen, 1985), three items with a 5-point response scale (very difficult to very easy) assessed the ease or difficulty of specific prostate cancer prevention and early detection activities. The items were: 1) making a decision about prostate cancer screening is; 2) having a digital rectal examination (DRE) every year is; and 3) giving a blood sample for serum prostate-specific antigen (PSA) test every year is. Total PBC scores ranged from 3 to 15, with a higher score indicating a higher level of ease.

Independent Variables

Intrapersonal

Participants were asked what year they were born and this response was subtracted from the current year (2018) to calculate the age of respondents. Attitude, derived from the Theory of Reasoned Behavior (Fishbein and Ajzen, 1975), was measured accordingly by assessing beliefs toward prostate cancer using three items on a 5-point response scale ranging from very unfavorable to very favorable. The three items were: 1) weighing the advantages and disadvantages of prostate cancer screening to make a decision about screening for prostate cancer; 2) getting tested for prostate cancer with the Digital Rectal Examination (DRE) every year; and 3) getting tested for prostate cancer using my blood sample for Serum Prostate Specific Antigen (PSA) test every year. Scores ranged from 3 to 15 and higher scores indicated a positive attitude toward prostate cancer screening. Education was assessed by asking the highest grade or year of school completed *(Primary School, Secondary High School, High School, Technical College, University (Degree), or Post-Graduate)*. Twenty items assessed knowledge about prostate cancer and prostate cancer screening using a "true," "false," and "don't know" scale (Odedina et al., 2011c). Domains included: limitations, diet, symptoms, screening age guidelines, risk factors. Responses were scored according to whether or not the participants responded correctly to each question, and the total number of correct responses was calculated (range from zero to 20) with higher scores indicating higher knowledge levels. Participants were classified as either married, divorced, widowed, separated, never married, or a member of an unmarried couple, to determine marital status.

Participants were asked to rate their perceived susceptibility of prostate cancer using a 4-item questionnaire. The response scale ranged from strongly disagree to agree on a scale of 1 to 5, with higher scores indicating higher perceived susceptibility. This measure was developed from the Perceived Susceptibility concept from the Health Belief Model (Hochbaum, 1958; Rosenstock, 1974a, b) and modified appropriately for use in the current study population. The four items were: 1) my chances of getting prostate cancer are great;

2) there is a good possibility that I will get prostate cancer; 3) I am not at risk for prostate cancer; and 4) there is no chance that I will get prostate cancer. Perception of health was assessed using a single item on how participants perceived their health with response choices including poor, fair, good, very good, excellent, and don't know/not sure.

Interpersonal

Cues to action regarding prostate cancer screening was measured using a 13-item questionnaire with yes/no responses and higher scores indicating a higher number of cues encountered within the last year. This measure was modified from the Cues to Action concept from the Health Belief Model (Hochbaum, 1958; Rosenstock, 1974a,b). Participants were asked about their type of employment to assess current employment status. Annual household income from all sources was collected and categorized into low, medium, and high using specific cutoffs for the currencies provided. Personal history of any cancer was assessed based on yes/no responses to a single question asking participants if they have had any type of cancer. Prostate cancer family history was measured based on yes/no responses to a question asking whether their birth fathers have had cancer. Social support was assessed by asking participants how often they get the social and emotional support they need using a single rating scale.

Institutional

Two items assessed informed decision-making (yes/no) by asking participants if their doctor had ever talked to them about the advantages and disadvantages of prostate cancer screening (Rimer et al., 2004). Prostate cancer information seeking was measured using four items with composite scores ranging from 4 to 20 and responses ranging from strongly disagree to strongly agree (Odedina et al., 2011c). Higher scores on this item indicated higher levels of engagement in seeking information regarding prostate cancer. Provider satisfaction was measured with a 6-item question with yes/no responses which determined the level of trust participants have in their providers. This measure was derived from the Trust of Health Care Providers scale (Blackman et al., 2018). Higher scores on this measure indicated higher levels of trust in health care providers. Regular source of care was measured using a single item to determine if participants had only one, more than one, or no person they thought of as their personal doctor or health care provider.

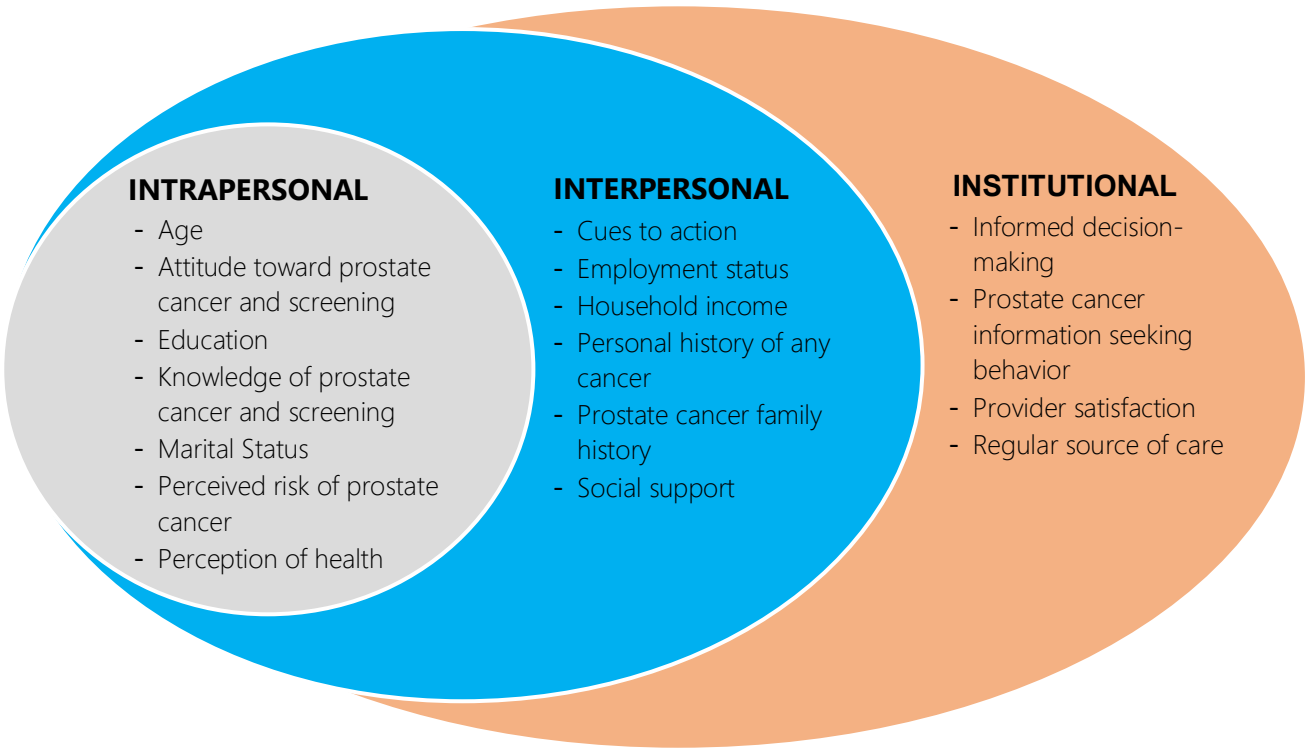
It is important to note that the multi-item measures used in this study have been validated for use in other studies conducted in Black men (Blackman et al., 2018; Cobran et al., 2014; Kaninjing et al., 2017; Kumar et al., 2009; Odedina et al., 2011a; Ogunsanya et al., 2016a). Table 1. contains a description of the scales and construct used in the study.

Table 1. Scales and Constructs of Measurement.				
DEPENDENT VARIABLE				
DOMAIN	VARIABLE	DESCRIPTION OF ITEM	ITEM(S)	SOURCES
DEPENDENT VARIABLE	Perceived behavioral control	Three items with a 5-point response scale measured the ease or difficulty of prostate cancer prevention and early detection activities. Scores ranged from 3 to 15, with a higher score indicating a higher level of ease *(Very Difficult, Difficult, Neutral, Easy, Very Easy)*.	3	Ajzen (Ajzen, 1985)
INDEPENDENT VARIABLES				
INTRAPERSONAL	Age	What is your date of birth *(MM/DD/YYYY)?*	1	-
	Attitude toward prostate cancer screening	Three-item questionnaire with scores ranging from 3 to 15 and higher scores indicating positive attitude towards prostate cancer screening. Scores ranged from 3 to 15 and higher scores indicating positive attitude towards prostate cancer screening (*Very Unfavorable, Unfavorable, Neutral, Favorable, Very Favorable)*.	3	Fishbein and Ajzen (Fishbein and Ajzen, 1975)
	Education	What is the highest grade or year of school you completed? *(Primary School, Secondary High School, High School, Technical College, University (Degree), or Post-Graduate)*.	1	-
	Knowledge of prostate cancer and screening	The 20 items on the knowledge scale assessed knowledge about prostate cancer and prostate cancer screening using a "true," "false," and "don't know" scale. Domains included: limitations, diet, symptoms, screening age guidelines, risk factors. Responses were scored according to whether or not the participants responded correctly to each question, and the total number of correct responses was calculated ranging from zero to 20, with higher scores indicating higher knowledge levels.	20	Odedina et al. (Odedina et al., 2011c)
	Marital status	Are you…? (*Married, Divorced, Widowed, Separated, Never Married, or A Member of an Unmarried Couple)*	1	-
	Perceived risk of prostate cancer	Four items with scores ranging from 4 to 20, using a 5-point bipolar semantic differential scales ranging from 1 – 5 with a set of anchors (*Strongly Disagree, Disagree, Neutral, Agree, Strongly Agree*).	4	Hochbaum (Hochbaum, 1958), Rosenstock (Rosenstock, 1974a, b)
	Perception of health	Would you say that in general your health is…? (*Poor, Fair, Good, Very Good, Excellent, Don't know/Not sure)*	1	-

INTERPERSONAL	Cues to action	A 13-item measure with yes/no responses on cues regarding prostate cancer screening. Higher scores indicated higher number of cues encountered within the last year (*Yes, No).*	13	Hochbaum (Hochbaum, 1958), Rosenstock (Rosenstock, 1974a, b)
	Employment status	What is your current employment status?	1	-
	Household income	What is your annual household income from all sources?	1	-
	Personal history of any cancer	Have you ever been told that you had any type of cancer? (*Yes, No*)	2	
	Prostate cancer family history	Has your birth father ever had cancer? *(Yes, No)*	2	-
	Social support	How often do you get the social and emotional support you need? (*Always, Usually, Sometimes, Rarely, Never).*	1	-
INSTITUTIONAL	Informed decision-making	Before you were tested for prostate cancer, did a doctor EVER talk with you about the advantages of prostate cancer screening? (*Yes, No*) Before you were tested for prostate cancer, did a doctor EVER talk with you about the disadvantages of prostate cancer screening? (*Yes, No*)	2	Rimer et al. (Rimer et al., 2004)
	Prostate cancer information seeking Behavior	Four items with scores ranging from 4 to 20, using a 5-point bipolar semantic differential scales ranging from 1 – 5 with a set of anchors (*Strongly Disagree, Disagree, Neutral, Agree, Strongly Agree*).	4	Odedina et al. (Odedina et al., 2011c)
	Provider satisfaction	Six items focused on the individual's perception of trust with their health care provider. A composite score was created from the items with higher scores indicating higher provider satisfaction *(Yes, No)*	6	Blackman et al. (Blackman et al., 2018)
	Regular source of care	Do you have one person you think of as your personal doctor or health care provider? (*Yes – Only one, More than one or No).*	1	-

Study Participants and Recruitment

This was a multi-institution study which included 16 universities/ medical health institutions in Nigeria, Cameroon, and the US. The institutional lead PI for each study site obtained local ethics committee/institution research board permission to conduct the studies. Informed consents were obtained by research assistants. One copy from each participant was retained by the research assistant and a second copy provided to the participant. Data were collected from participants who met the selection criteria and provided informed consent to participate in the study. The sample size estimated to power this study adequately was 290 respondents. The study model with all of the variables of interests is shown in Figure 1.



Data analysis

Each continuous/interval variable was examined for its distribution, range, mode, median, mean, and standard deviation. Normality tests, skewness, and kurtosis were carried out on continuous and interval-level variables. All interval-level data (dependent variable only) were screened to ensure that the normality assumptions were met before applying statistical tests. Independent samples *t*-tests (for explanatory variables with two levels) and ANOVA (for explanatory variables with more than two levels) were conducted on study variables. For dichotomous and nominal-level variables, frequencies were assessed to determine if the requirements for cell sizes are met. Finally, the data was screened for missing values and outliers. We tested the socio-ecological model using multiple regression analyses. In the interest of parsimony, the variables included in the final model were assessed regarding their statistical

significance (*p<0.05)*. This approach allowed the final model to include combined intrapersonal, interpersonal, and institutional variables.

To create meaningful and interpretable categories, variables with multiple levels of categories were collapsed. Education was recoded into high school or less, college/university, and postgraduate. Marital status was recoded into two categories: in a relationship (married/member of unmarried couple) and not in a relationship (divorced, widowed, separated, and never married). Employment status was recoded into: currently employed (employed for wages, self-employed) and not currently employed (out of work, housewife, student, retired, unable to work, disability). Probability values with *p<0.05* were considered significant. Reliability was assessed using an index of internal consistency (e.g., Cronbach's alpha). All analyses were coded and analyzed using SPSS version 24.

RESULTS

Sample Characteristics

A total of 500 Black men with an average age of 48±10 years (range 35 to 75 years) were recruited into the study. Participant demographics and characteristics are included in Table 2. The final model included the following significant variables from the bivariate analyses: attitude, education, knowledge, marital status, cues to action, informed decision, and information-seeking behavior.

Perceived Behavioral Control (PBC)

The internal consistency, as measured by the Cronbach's alpha α, was 0.77, which indicates acceptable reliability. The composite PBC score was 10.51±2.54 out of a possible score range of 3 to 15 (higher scores indicating greater ease of PBC), which means that participants neither had ease or difficulty in engaging in specific prostate cancer prevention and early detection activities. PBC correlated positively with attitude (*r*=0.271, *p<0.05)*, knowledge (*r*=0.115, *p<0.011)*, cues to action (*r*=0.140, *p<0.002)*, and prostate cancer information seeking behavior (*r*=0.251, *p<0.001)*. Those with a postgraduate degree (10.75±2.46) and college degree (10.68±2.51) had significantly higher PBC scores than those with high school or less degree (10.07±2.59).

Participants in a relationship had significantly higher PBC scores than those not in a relationship (10.52±2.54 vs. 8.13±2.61, respectively). Finally, those who were informed about the advantages and disadvantages of prostate cancer screening (12.47±2.83) had significantly higher scores than those who were uninformed (10.44±2.50). The results are contained in Table 2.

Table 2. Participant Demographic and Characteristics (N=500).

Characteristics	n[a] (%)	Mean±SD of PBC scores	Bivariate significance (*t, F,r*)[b]	*p*
DEPENDENT VARIABLE				
Perceived Behavioral Control		10.51±2.54		
INDEPENDENT VARIABLES				
INTRAPERSONAL				
Age		48±10	r=0.073	0.111
Attitude towards prostate cancer screening		10.56±3.69	r=0.271	<0.001**

Education			F= 3.255	0.039*
High school or less	150 (30.0)	10.07±2.59		
College/University	216 (43.2)	10.68±2.51		
Postgraduate	123 (24.6)	10.75±2.46		
Knowledge of prostate cancer and screening		10.31±3.66	r=0.115	0.011*
Marital status			t=2.678	0.021*
In a relationship (married/member of unmarried couple)	463 (92.6)	10.52±2.54		
Not in a relationship (divorced, widowed, separated, and never married)	34 (6.8)	8.13±2.61		
Perceived risk of prostate cancer		10.27±2.89	r=0.027	0.566
Perception of health		4.43±8.72	r=-0.038	0.406
INTERPERSONAL				
Cues to action		1.60±2.13	r=0.140	0.002**
Employment status				
Currently employed (employed for wages, self-employed)	427 (85.4)	10.45±2.52	F=1.404	0.237
Currently unemployed (not currently employed (out of work, housewife, student, retired, unable to work, disability)	71 (14.2)	10.85±2.70		
Household income				
Low	117(23.4)	10.39±2.46	F=1.234	0.292
Middle	90 (18.0)	10.36±2.61		
High	178 (35.6)	10.80±2.59		
Personal history of any cancer				
Yes	17 (3.4)	11.18±3.63	t=-1.096	0.274
No	481 (96.2)	10.49±2.50		
Prostate cancer family history				
Yes	10 (2.0)	10.11±1.54	t=0.363	0.717
No	418 (83.6)	10.41±2.47		
Social support		2.41±1.24	r=-0.080	0.086
INSTITUTIONAL				
Informed decision-making				
Yes	18 (3.6)	12.47±2.83	t=3.268	0.001**
No	482 (96.4)	10.44±2.50		
Prostate cancer information seeking behavior		14.73±3.19	r=0.251	p<0.001**
Provider satisfaction		4.05±1.35	0.064	0.164
Regular source of care				
No	260 (52.0)	10.45±2.55	0.476	0.753
Yes, only one	142 (28.4)	10.79±2.50		
More than one	78 (15.6)	10.39±2.57		

[a]Total does not equal 500 because of missing responses.

[b]t represent t-test statistics, F from the analysis of variance (ANOVA) test and r from Pearson's correlation

*p < .05 (two-tailed). **p < .01 level (two-tailed)

Model Testing

Participants had a neutral attitude towards prostate cancer screening based on their score 10.56±3.69 (possible range of 5 to 15). The total knowledge score was low 10.31±3.66 (possible range of 0 to 20). Cues to action were also very low 1.60±2.13 (possible range of 0 to 13). Responses regarding prostate cancer seeking information were neutral: 14.73±3.19 out of a possible range of 4 to 20. Majority of the respondents were those with a college/university degree (n=216, 43.2%). More than 90 percent of the respondents reported being in a relationship (n=463, 92.6%). Similarly, majority of the participant (n=483, 96.3%) were not informed of the advantages and disadvantages of prostate cancer screening. The PBC regression model was significantly different from zero, $F=9.32$, $df=8,463$; $p<0.001$. The final model accounted for 49% of the variation in PBC ($R^2=0.49$). The results are shown in Table 3.

Table 3. Multiple Regression Analysis of Overall Perceived Behavioral Control (N=500).

Variables	Unstandardized Coefficients	Standardized Coefficients		95.0% Confidence Interval[a]		
	B	Std. Error	Beta	Lower Bound	Upper Bound	P-values
Intercept	6.60	0.79		5.04	8.16	<0.001**
INDEPENDENT VARIABLES						
Intrapersonal Factors						
Attitude	0.15	0.04	0.21	0.00	0.08	<0.001**
Education[b]						
College/University	0.10	0.16	0.03	-0.21	0.41	0.523
Postgraduate	0.30	0.27	0.21	-0.23	0.84	0.269
Knowledge	0.92	0.57	0.27	0.49	1.33	0.017*
Marital status[c]	-0.34	0.49	-0.36	-1.31	0.62	0.482
Interpersonal Factors						
Cues to actions	0.04	0.06	0.03	-0.07	0.15	0.493
Institutional Factors						
Informed decision making	2.24	0.74	0.18	0.78	3.70	0.003*
Prostate cancer information seeking behavior	0.13	0.05	0.17	0.03	0.22	0.008*
F statistic =9.32; df=8, 463; Model p-value <0.001; R^2=0.49; Adjusted R^2=0.41						

DISCUSSION

This was a study of a heterogeneous mix of Black men from the Nigeria, Cameroon, and the US. The objectives of this study were to examine the PBC of Black men in West Africa and the US and to determine its correlates. This study has several findings. First, perceived control over engaging in prostate cancer screening were neither easy nor difficult. Second, these beliefs are stronger in individuals with positive attitudes, when controlling for other factors. Third, a higher knowledge level are associated with higher level of PBC. Fourth,

when participants are given the balanced information regarding the advantages and disadvantages of prostate cancer screening, their perceived control over engaging in the behavior is higher. Fifth, individuals who are more proactive in seeking information regarding prostate cancer and screening have higher levels of PBC.

Though there is a lack of consensus among medical professional groups about its usefulness, prostate cancer screening remains the most common method for early detection of disease in men without symptoms (Carter et al., 2013; Ogunsanya et al., 2016b). The overall PBC score was neutral meaning that participants neither had ease or difficulty in engaging in specific prostate cancer prevention and early detection activities. The neutral overall PBC score could be because Black men are less likely to seek care and participate in preventative health-related activities, such as prostate cancer screening (Blocker et al., 2006; Griffith et al., 2011; Pedersen et al., 2012). Furthermore, on examining the individual items that made up the PBC scale, participants responded having a higher degree of ease in engaging in making decisions regarding prostate cancer screening and engaging in PSA screening. However, the question regarding DRE had the lowest score, indicating a degree of difficulty in engaging in that behavior. As a result, the composite PBC score was neutral. The finding regarding unfavorable beliefs toward DRE have been reported in studies where Black men in general show greater resistance to DREs and found it embarrassing and a threat to their masculinity (Ogunsanya et al., 2016b; Sanchez et al., 2007; Winterich et al., 2009b).

Others explanations for the neutral PBC scores include the costs of the tests, poor access to healthcare facilities, low level of education, lack of awareness about prostate cancer screening, fear of loss of masculinity, physicians' attitudes, fewer options of treatment, and religious and cultural beliefs/attitudes (Ogunsanya et al., 2016b; Winterich et al., 2009a). These factors may result in men presenting with late stages of prostate cancer with complications when they are diagnosed (Adeloye et al., 2016; Akinremi et al., 2011), consequently resulting in increased morbidity and mortality (Olapade-Olaopa et al., 2014). However, unlike previous studies which have mostly been conducted in US Black and Caucasian males, the current study is the first to focus on a heterogeneous sample of Black males from the US and West Africa.

Health education programs aimed at increasing levels of control an individual has over engaging in behaviors such as prostate cancer screening can target improving attitude. While attitude is yet to be explored as a determinant of PBC, it has been reported to be a strong predictor of engaging in prostate cancer preventative behaviors (Mitchell, 2011; Ogunsanya et al., 2016a). It was observed in this study that higher knowledge levels are associated with higher PBCs. Sometimes education may be reflection of other socioeconomic factors such as income or health literacy (Winterich et al., 2009a). A higher income may increase access to health care services. This may be the reason for higher PBCs observed in men with higher levels of education. So future interventions should also focus on men with low education as well as ensure the information in media campaign is understandable to audiences with low literacy levels.

Black men's knowledge and perceptions of prostate cancer screening have been studied

extensively (Morrison et al., 2017; Ogunsanya et al., 2017; Owens et al., 2015). The current study shows that when men know the essential domains of prostate cancer and screening, such as diet, limitations, risk factors, and screening age guidelines, they were more likely to have higher levels of perceived control over engaging in prostate cancer screening. Black men who were told of the advantages and disadvantages of prostate cancer screening were more likely to have a higher perception of control over screening. These findings highlight the importance of healthcare providers incorporating informed decision-making practices in messages aimed at increasing levels of prostate cancer screening engagement. The pivotal role providers play is well documented in the extant literature (Ogunsanya et al., 2016c; Pucheril et al., 2015). This observation is in line with the findings from another study which reported that majority of Black men acted on their doctor's instruction to undergo prostate cancer screening after they had complained to their doctor about their symptoms (Enaworu and Khutan, 2016). Finally, being proactive about one's health and actively seeking information regarding prostate cancer prevention and early detection was positively associated with higher levels of PBC.

Several limitations of this study must be considered. The study design was cross-sectional, which only provides a one-time snapshot. Given this was a self-reported survey, recall bias could also be a limitation as responses given by participants may have been inaccurate. Cameroon is a Francophone country, therefore including only English-speaking participants, who may not be bilingual, reduces the generalization of our study findings. Regardless of these limitations, this study fills a critical gap in assessing PBC in a group of heterogeneous Black men from Nigeria, Cameroon, and the US, and it provides insights for future studies.

CONCLUSION

Using a socio-ecologic approach, multi-level factors were integrated to facilitate a fuller understanding of the several factors impacting PBC in Black men. The four significant factors (attitude, knowledge, informed decision-making, and prostate cancer information seeking behavior), which are all modifiable, could be considered when developing culturally-sensitive interventions aimed at engaging at-risk Black men regarding prostate cancer prevention and early detection practices. While attitude and knowledge have been reported as positive correlates in engaging in prostate cancer screening in Black males, the unique contribution of this study are the roles informed decision-making and prostate cancer information seeking behavior play as well, especially in ethnically-diverse Black males.

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Conflict of interest

The authors declare that no competing or conflict of interests exist. The funders had no role in study design, writing of the manuscript, or decision to publish.

Authors' contributions

Motolani Ogunsanya conducted the statistical analysis of the project.Motolani Ogunsanya, Iya Bassey, Mohammed Faruk and Catherine Oladoyinbo provided content and generated the initial draft of the article.Haruna Nggada, Abidemi Omonisi, Nissa Askins, Blaise Nkegoum, Ademola Popoola, Iheanyi Okpala, Omolara Fatiregun, Paul Jibrin, Emeka Iweala, Wole Kukoyi, Kayode Adeniji, Ayo Salako, and Anthonia Sowumni contributed to the acquisition of data and the conduct of the project.Folakemi Odedina provided content and reviewed the final manuscript

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