RESEARCH

Prostate Cancer Risk-Reduction Behaviors among US Black Males Less Than 40 Years Old

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ABSTRACT

Prostate cancer (CaP) is the leading cause of cancer deaths among Black men and modifications in lifestyle represent an important means of primary CaP prevention in young Black men. Thus, this study aimed to explore the cognitive-behavioral and demographic factors related to prostate cancer risk-reduction behaviors (CaPB) among young Black men in Texas, United States and to examine relationships between these factors. This was a cross-sectional study of 267 Black men aged 18 to 40 years. A survey collected information on demographics, exercise, knowledge of CaP and screening, cues to action, and current engagement in CaPB. Participants were young Black males of different ethnicities and education levels recruited from local universities, churches, organization, and fraternities. Descriptive statistics (means, standard deviations, and frequencies) were calculated for all variables, and multiple regression was employed to determine the significant ($p<0.05$) predictors of CaPB. Participants had low knowledge levels (mean=5.25±3.81; range 0-14), engaged in moderate levels, duration, and intensity of exercise (mean=6.44±3.147; range 0-10), mostly reported negative cues to action (79.4%), and engaged in low levels of CaPB (mean=13.7±5.62; range 0-40). Knowledge, academic classification, major field of study, and regular source of care were significant predictors of CaP risk-reduction behaviors, and the overall model accounted for 39% ($p<0.01$) of the behaviors. The significant, modifiable factors (such as knowledge levels and regular source of care) should be considered in the development of strategies aimed at increasing younger Black men's engagement in CaPB.

KEYWORDS: prostate cancer, young Black men, risk-reduction, health behaviors

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INTRODUCTION

Black men have the highest incidence of prostate cancer (CaP) in the US (Siegel et al., 2014). The CaP disparities observed in Black men are alarming when compared to men from other ethnicities on survival rates (Li et al., 2012), morbidity (Powell et al., 2010), or mortality (Odedina et al., 2009). Compared to Caucasian men, Black men have a CaP incidence rate more than 60% higher and a mortality rate almost three times greater (Odedina et al., 2009). Despite the controversies associated with CaP screening (Lin et al., 2011; McNaughton-Collins and Barry, 2011; Moyer, 2012), it still remains the only method of detecting the disease early. While the survival rate for CaP when diagnosed and treated early can be as high as 100%, Black men still have worse CaP prognosis when compared to other men (Sanchez et al., 2007).

A review of the literature indicates that, despite attempts to increase awareness of and access to CaP screening, there have been delays among Black men in utilizing primary health care services (Cheatham et al., 2008). Black men often forgo preventive services, choosing instead to delay treatment or avoid health care altogether (Cheatham et al., 2008). Further, several studies conducted in Black men have demonstrated low knowledge levels regarding CaP, especially its risk factors like positive family history and ethnicity (Lee et al., 2012; Ogunsanya et al., 2017). This knowledge gap is especially important because two of the major risk factors associated with CaP are race (Black race) and ethnicity (Scher et al., 2015; Tourville and Nguyen, 2013).

While there have been mixed findings on the relationship between lifestyle choices and CaP, increased intake of dietary fat have been found to play an independent role in the development of CaP (Odedina et al., 2011a; Tourville and Nguyen, 2013). Cumulative exposure to androgens and high-fat diets, for example, have been reported to increase CaP risk (Wu and Modlin, 2012). This pattern of exposure has been established across case-control studies, ecologic studies, animal models, and studies involving immigrants (Mauermann et al., 2011; Simopoulos, 2010; Wigle et al., 2008). Conversely, studies have demonstrated the potential anticancer and antioxidant effects of lycopene or tomato products, especially against CaP (Giovannucci et al., 2002). However, these studies also reported a lower consumption of tomato-based products among Black men compared to other ethnic groups, which translated to lower serum lycopene levels and a higher risk of CaP. Physical activity has also been associated with reduced risk of CaP, especially beginning from the mid-teens (Liu et al., 2011). Other lifestyle modifications such as smoking cessation, weight control, and the use of chemopreventive agents can decrease CaP risk (Cuzick et al., 2014). However, other studies have reported no additive benefits of these primary modes of cancer prevention (Lippman et al., 2009; Whittemore et al., 1995).

Modifications in lifestyle are the most likely means of primary prevention of CaP. There are mixed or inconclusive findings from research concerning the relationship between lifestyle modification and CaP, but given the known relationship between diet, exercise, smoking, and other modifiable factors related to other common cancers, lifestyle modification can be an important prevention consideration (Verma et al., 2014). Diet remains the only known risk factor that may be modified to

reduce a man's chance of developing CaP, thus an important element in primary prevention. Some research studies indicate that meat cooked at high temperatures contain considerable levels of mutagens that can lead to an elevated level of CaP risk (Daniel et al., 2011; Mandair et al., 2014). A diet low in fat and high in vegetable intake may have some preventive effects (Kolonel et al., 2000), however many men do not meet the recommended dietary guidelines and therefore appear to be at increased risk of developing CaP (Dixon et al., 2007).

Millon-Underwood and Sanders (Millon-Underwood and Sanders, 1990) examined the factors responsible for health promotion behaviors in Black men (N=177). This study was specifically focused on modifiable behaviors that reduced cancer risk, or that can detect cancer early. Findings from the study showed that beliefs related to cancer risk, decreasing carcinogen exposures, and beliefs related to the influence of health care providers significantly contributed to explaining 72% of the variance in health-promoting behaviors. Further, the Black men in the study did not consider themselves very health-conscious with just over half of the sample (56%) having reported paying attention to their bodies while only 42% stated that they were involved in one form of physical activity or the other. Twenty-three percent of the men in the survey reported that their diet consisted of an adequate amount of vitamins, minerals, fiber, and dietary fat. Some chemoprevention agents such as 5-α-reductase inhibitors, NSAIDs, selenium, allium vegetables, soy/isoflavones, green tea polyphenols, vitamins D and E, and statins, have been considered for reduction of CaP and may reduce CaP mortality (Colli and Amling, 2009). While there is no conclusive evidence for the chemopreventive benefit of nutrients or vitamins, it remains a significant part of CaP prevention and early detection.

In order to limit the focus of this study to behaviors conformable to interventions on cancer-related outcomes in Black males, this study was based on the following assumptions: (1) starting the conversation about preventive health behaviors in the early adult years can increase the likelihood of risk-reduction behaviors and early detection of CaP in later years; (2) informed decision-making regarding CaP screening among high-risk men (Black ethnicity and familial history) will reduce mortality and morbidity rates; (3) and that when adequately informed about the potential risks of this disease, *younger* men can be proactive in reducing some of the modifiable risks associated with CaP. Thus, the primary objective of this study was to explore the cognitive-behavioral and demographic factors related to CaPB among young Black men and to examine the relationships between these factors.

Methods

Research Design and Participants

This was a cross-sectional survey design study using questionnaires. Young Black males (aged between 18 and 40 years), who identified as Black and understood written and spoken English were included in the study. Non-Black males, non-English speaker, and those aged under 18 or over 40 years were excluded from the study. Participants were recruited from churches, local organizations, and colleges and universities surrounding The University of Texas at Austin in Texas.

Measures

A 39-item instrument was administered to participants. The questionnaire contained a 10-item scale measuring current engagement in CaP risk-reduction behaviors and 29 items measuring: age (1 item), cues to action (1 item), knowledge (14 items), exercise (3 items), and demographic/personal factors (10 items).

Study Variables

Dependent Variable

Current engagement in risk reduction behaviors was measured using the 10-item Prostate Cancer Prevention Behavior (CaPB) Scale from The Personal Integrative Model of Prostate Cancer Disparity (PIPCaD) developed by Odedina et al.(Odedina et al., 2011b) The items in the PIPCaD scale assessed participants' engagement in lifestyle activities to reduce CaP risk factors, including low-fat diet consisting mainly of fruits and vegetables, and the use of supplements within the last week. Items were measured on a 5-point scale ranging from never (0) to 2 or more times a day (4), with higher scores indicating higher levels of engagement in CaPB. Scores ranged from 0 to 40. Participants were asked to indicate: 1) how often they consumed fruits, vegetables, meat products, dairy products, and butter/oil within the last week, and 2) if they have taken the following supplements - selenium, lycopene, Vitamin A and other retinoids, Vitamin D and soy within the last week. The PIPCaD has been used in other studies (Cobran et al., 2014; Morrison et al., 2017) and reported to have high internal consistency.

Independent Variables

Age

Age was calculated by subtracting the year of birth reported by participants from the year of study (2014).

Cues to Action

Using a Yes (1)/No or Don't Know (0) response scale, a single item was used to measure participants' cues to action. The measure asked about CaP histories from person(s) close to the participants. Those who responded to 'No' or 'Don't Know' were coded as '0,' while those who responded 'Yes' to knowing someone with CaP were coded as '1.'

Knowledge

Knowledge was assessed using a 14-item scale with six domains (limitations, side effects from treatment, symptoms, risk factors, screening age guidelines, and screening controversy). The knowledge scale comprised of twelve items from the Knowledge about Prostate Cancer Screening Questionnaire by Weinrich et al. (Weinrich et al., 2004) and two items assessing dietary knowledge and screening controversy by Odedina et al. (Odedina et al., 2011b).

Exercise

Participants' exercise level, frequency, and duration were measured using three items derived from the Personal Integrative Model of Prostate Cancer Disparity (PIPCaD model) by Odedina et al. (Odedina et al., 2011b). The three items were summed up to create a composite score for exercise with higher scores indicating higher exercise time, intensity, and level. Composite scores ranged from 0 to 10.

Demographic/Personal Factors

Ten items assessed demographic/personal factors. They include: 1) academic classification (less than

high school or high school graduate or GED, college freshman, college sophomore, college junior, college senior, graduate student, or postgraduate); 2) income (<$30,000 or ≥$30,001); 3) ethnicity (African American of American origin [born and grew up in America], African, African American of African origin [born in Africa but now American citizen], African American of Caribbean origin [born in one of the Caribbean Islands but now American citizen], or Caribbean); 4) family history of CaP (yes, no); 5) health insurance status (private insurance [e.g., BlueCross/ Blue Shield, Humana], no insurance/self-pay, public insurance [e.g., Medicaid] or not sure); 6) major/field of study (professional and applied sciences (e.g., architecture, business, communication, education, engineering and law), humanities (e.g., fine arts, liberal arts and public affairs) and natural/healthcare sciences (e.g., natural sciences, nursing, pharmacy, social work and medicine)); 7) marital status (single, not in a relationship; single, in a relationship; and married/partner/ living together); 8) perception of health status (fair, good, excellent); 9) regular source of care (none, less than 1 year, 1–5 years, 6–10 years, more than 10 years); and 10) residency (rural, urban, suburban).

Prior to administering the study questionnaire, it was pretested among 15 Black men to ensure content validity and readability of all questions and response categories.

Recruitment of Participants and Data Collection

The Institutional Review Board (IRB) at The University of Texas at Austin approved the study. Following IRB approval, participants were recruited from colleges and universities located around The University of Texas at Austin, as well as local organizations, community liaisons, and churches. A $20 VISA gift card was provided to participants as compensation for the time spent in completing the survey. Data was collected from local universities, churches, organization, and fraternities between February 2014 to April 2014, in Austin Texas using a mixed mode of survey distribution (paper-pencil and web-based using Qualtrics).

Data Analyses

All study variables were summarized using descriptive statistics (frequencies, means, and standard deviations). The reliability of the multi-item scales, CaPB, and knowledge, were evaluated via Cronbach's alpha. To develop a more parsimonious model, demographic/personal factors that were not related to the dependent variable were excluded from the multivariate analyses. Multiple regression models were constructed to examine statistically significant predictors of CaPB. The significance levels were set at 0.05 and data analyses were conducted using statistical package SPSS 24 (International Business Machine Corp., Armonk, New York).

RESULTS

A total of 267 Black men participated in the study, with an average age of 26±7 years (range, 18-40). Of the 267 participants, 171 (64%) were African-American of American origin, 50 (18.9%) reported their academic classification as college freshmen. More than 70% (n=212) reported negative cues to action and majority (n=233; 87.6%) reported a negative family history of CaP. More than half (n=138; 52.5%) of the participants perceived their health to be good and more than 30% (n=90) had private insurance. Most participants (n=134; 51.0%) resided in urban areas and 41.9% (n=112) reported having no regular source of care. The exercise scale had a mean of 6.44±3.14 out of a possible

score of 0-10 (higher scores indicate a higher level, duration, and intensity of exercise). Mean knowledge levels were low among respondents with a score of 5.25 ± 3.81 (possible range of 0 to 14). Descriptive characteristics of all other demographic variables are reported in Table 1. To build the parsimonious model, bivariate comparisons of CaP risk-reduction behavior scores were made with the independent variables. Academic classification, cues to action, family history of CaP, major field of study, and regular source of care were the only significant predictors of CaP risk-reduction behavior and were included in the final multivariate model. The results are summarized in Table 1.

Table 1. Mean Prostate Cancer Risk Reduction Behavior Scores by Study Variables (N=267)[a].

Demographics	n[a] (%)	Mean ± SD of Intention Scores	t or F	*p*
Academic Classification			2.81	0.019*
Less than high school/GED/High School Graduate	22 (8.3)	15.00 ± 5.54		
Freshman (College)	50 (18.9)	13.36 ± 6.03		
Sophomore (College)	35 (13.3)	12.69 ± 5.44		
Junior (College)	47 (17.8)	12.80 ± 5.56		
Senior (College)	48 (18.2)	12.93 ± 5.54		
Graduate Student	30 (11.4)	15.83 ± 5.76		
Postgraduate (e.g., MS, JD, MD, PhD)	32 (12.1)	14.97 ± 5.04		
Cues to Action[b]			3.94	0.033*
No	212 (79.4)	10.50 ± 5.43		
Yes	55 (20.6)	14.39 ± 6.23		
Ethnicity			1.28	0.283
African-American of American origin	171 (64.0)	13.80 ± 6.02		
African	45 (16.9)	12.95 ± 4.88		
African-American of African origin	28 (10.5)	15.18 ± 4.55		
African-American of Caribbean origin/Caribbean	23 (8.6)	12.45 ± 4.81		
Family History of Prostate Cancer			8.18	0.005**
No	233 (87.6)	13.64 ± 5.39		
Yes	33 (12.4)	14.21 ± 7.10		
Health Insurance			1.07	0.364
Private Insurance (E.g., BlueCross/Blue Shield)	90 (34.7)	13.78 ± 5.86		
Public Insurance (E.g., CHIP, Medicaid)	48 (18.5)	14.87 ± 5.22		
Not Sure	41 (15.8)	12.73 ± 5.73		
No Insurance/Self-Pay	80 (30.9)	13.73 ± 5.65		
Income			0.70	0.404
≤$30,000	126 (47.9)	13.04 ± 5.35		
≥ $30,001	137 (52.1)	14.06 ± 5.69		
Major/Field of Study			3.73	0.025*
Professional & Applied Sciences	153 (58.1)	13.00 ± 5.29		
Natural & Healthcare Sciences	65 (24.3)	15.29 ± 5.81		

Humanities	47 (17.6)	13.83 ± 6.08		
Marital Status			1.19	0.305
Single, NOT in a relationship	121 (46.2)	13.76 ± 5.62		
Single, IN a relationship	88 (33.6)	13.15 ± 5.60		
Married/ Partner/Living together	53 (20.2)	14.69 ± 5.78		
Perception of Health Status			1.22	0.297
Fair	44 (16.7)	14.73 ± 6.27		
Good	138 (52.5)	13.28 ± 5.19		
Excellent	81 (30.8)	14.00 ± 5.82		
Regular Source of Care			3.83	0.026*
None	112 (41.9)	12.99 ± 5.17		
Less than 1 year	55 (20.6)	14.94 ± 5.64		
1 – 5 years	60 (22.5)	13.13 ± 5.75		
More than 6 years	40 (15.0)	14.78 ± 6.29		
Residency			0.84	0.433
Urban	134 (51.0)	13.73 ± 5.51		
Suburban	110 (41.2)	13.51 ± 5.67		
Rural	19 (7.1)	15.32 ± 5.93		

[a]Total does not equal 267 due to missing responses

[b]Cues to action was collapsed into two categories: "0" represents those who answered "No" to having someone close to them who has ever had prostate cancer and "1" represents those who answered "Yes" to having someone close to them who has ever had prostate cancer

*Indicates significance at $p < 0.05$

**Indicates significance at $p < 0.01$

Prostate Cancer Risk-Reduction Behavior (CaPB)

The CaPB scale showed acceptable reliability as measured via internal consistency (Cronbach's α=0.68). The CaPB scale had a mean of 13.70 ± 5.62 (range of 0-40). Many of the participants ate fruits (n=111; 41.6%), vegetables (n=94; 35.5%), dairy products (n=83; 31.4%), and butter/oil 1-3 times a week (n=83; 31.4%). More than one-third (n=97; 36.5%) of participants consumed meat products two or more times a day. Finally, the majority of the participants did not use chemoprevention products such as selenium, lycopene, Vitamins A, and D, retinoid, and soy within the last week [See Table 2].

Table 2. Frequency Distribution of Participants' Risk Reduction Behaviors (N=267)
Q. Think about your eating habits within THE LAST WEEK. Counting breakfast, lunch, dinner, snacks and eating out, please state how often you ate the stated food or took the stated nutrients:

		Frequency Distribution of Response Choices N (%)							
		Na	Mean	SD	Never (0)	1 – 3 times a WEEK (1)	4 – 6 times a WEEK (2)	Once a DAY (3)	2 or more times a DAY (4)
1.	Fruit (fresh, canned or juice but not sodas).	267	1.88	1.10	12 (4.5)	111 (41.6)	71 (26.6)	43 (16.1)	30 (11.2)
2.	Vegetables (such as greens, vegetable soup, stew, green salad, string beans, peas, corn, broccoli).	265	2.02	1.08	8 (3.0)	94 (35.5)	82 (30.9)	47 (17.7)	34 (12.8)
3.	Meat products (such as beef, goat, chicken, pork, steaks, roasts, ribs, hamburgers, ground beef, hotdog, sausage).[d]	266	1.27	1.16	7 (2.6)	33 (12.4)	82 (30.8)	47 (17.7)	97 (36.5)
4.	Dairy products (such as milk, cheese, eggs).	264	1.86	1.10	7 (2.6)	83 (31.4)	75 (28.4)	63 (23.9)	36 (13.6)
5.	Butter or oil on food or in cooking.	267	1.91	1.09	10 (3.7)	83 (31.4)	81 (30.3)	60 (22.5)	33 (12.4)
6.	Selenium to prevent prostate cancer.	266	0.63	0.99	173 (65.0)	40 (15.0)	33 (12.4)	18 (6.8)	2 (0.8)
7.	Lycopene to prevent prostate cancer.	267	0.60	1.02	183 (68.5)	34 (12.7)	26 (9.7)	21 (7.9)	3 (1.1)
8.	Vitamin A and other retinoid to prevent prostate cancer.	267	1.15	1.22	113 (42.3)	60 (22.5)	46 (17.2)	38 (14.2)	10 (3.7)
9.	Vitamin D to prevent prostate cancer.	266	1.53	1.23	72 (27.1)	60 (22.6)	71 (26.7)	47 (17.7)	16 (6.0)
10.	Soy to prevent prostate cancer.	267	0.78	1.09	154 (57.7)	50 (18.7)	36 (13.5)	21 (7.9)	6 (2.2)
Score Total		266	13.7[b]	5.62					
Cronbach's Alpha[c]		0.68[c]							

[a]Totals do not equal 267 due to missing responses

[b]The composite score for the overall scale calculation based on 267 responses, possible scale range 0 to +40

[c]Cronbach's alpha based on 10 items

Predictors of Prostate Cancer Risk-Reduction Behavior (CaPB)

Knowledge and age were positively correlated with CaPB; the correlation matrix is reported in Table 3.

Table 3. Correlations (*r*), Descriptive Statistics, and Reliability Statistics for Prostate Cancer Risk-Reduction Behavior Scores, and other Predictor Variables (N=267)

Prostate cancer risk-reduction behavior scores, and other predictor variables	Age	Exercise	Knowledge	Mean (SD)	Actual Range	Cronbach's α
1. Prostate cancer risk reduction behavior	0.13*	-0.02	0.17**	13.70 (5.62)	1 to +30	0.68
2. Age		-0.14*	0.18**	26.44 (6.67)	18 to 40	-
3. Exercise			-0.05	6.44 (3.14)	0 to +10	0.85
4. Knowledge				5.25 (3.81)	0 to +13	0.84

* p < .05 level (2-tailed); ** p < .01 level (2-tailed)

The CaPB regression model was statistically significantly different from zero, F=4.12, df = 18, 250; p < 0.01. Approximately 39% of the variation in CaPB (R^2 = 0.39) was accounted for by the predictor variables, with knowledge, academic classification, major/field of study, and regular source of care being significant factors. The results of the multiple regression are presented in Table 4. In summary, the model accounted for a large variance in engagement in CaPB.

Table 4. Multiple Regression Analysis of Prostate Cancer Risk-Reduction Behaviors (N=250).

Variable	Standardized Coefficients	95.0% Confidence Interval[a]		
	Beta	Lower Bound	Upper Bound	P-values
Intercept		11.31	20.80	<0.01**
Independent Variables				
Age	-0.31	-0.05	-0.17	0.08
Cues to Action[b]	0.07	-1.12	2.92	0.39
Exercise	0.03	-0.17	0.29	0.61
Knowledge	0.26	0.18	0.40	<0.05**
Covariates				
Academic Classification[c]				
Freshman (College)	-0.13	-4.81	1.05	0.21
Sophomore (College)	-0.28	-5.94	-0.40	0.027*
Junior (College)	-0.15	-5.10	0.72	0.14
Senior (College)	-0.22	-5.71	-0.28	0.018*
Graduate Student	0.05	-2.21	4.05	0.56
Postgraduate (e.g., MS, MD, PhD)	-0.02	-3.71	2.97	0.83
Family History of Prostate Cancer[d]	-0.05	-3.36	1.71	0.52
Major/Field of Study[e]				
Professional & Applied Sciences	-0.20	-4.15	-0.54	<0.05**
Humanities	-0.12	-3.96	0.58	0.14

Regular Source of Care				
Less than 1 year	0.11	-0.35	3.62	0.11
1 – 5 years	-0.05	-2.48	1.25	0.52
More than 6 years	0.16	-0.30	3.84	0.03*
F statistic =4.12; df=18, 250; Model p-value< 0.01; R^2=0.39; Adjusted R^2=0.34				

[a]CI = confidence interval of unstandardized coefficients

[b]Reference category: No

[c]Reference category: Less than high school/GED/High School Graduate

[d]Reference category: No

[e]Reference category: Natural & healthcare sciences

*Indicates significance at p < 0.05

**Indicates significance at p < 0.01

DISCUSSION

The summary score on the dependent variable, CaPB, was low with an average score of 13.7 (possible score of 40). This finding could be because the majority of the participants sampled were not taking vitamins/supplements to prevent CaP, which is not unexpected given the age range of the participants. Also, young Black men in this study consumed more quantities of food associated with risk of CaP (e.g., meat, butter) and fewer quantities of foods that can decrease risk (fruits, Vitamin A, Vitamin D). The low consumption of CaP risk-reducing foods such as vegetables has been well documented in Blacks, with Black young adults consuming a higher intake of saturated fat and cholesterol (Zamora et al., 2010) than their White counterparts. The CaPB scale was found to be reliable in assessing the variables of interest, which is consistent with studies done by Cobran et al. and Odedina et al. (Cobran et al., 2014; Odedina et al., 2011a). Knowledge was positively and statistically significant (p<0.01) with engagement in CaPB, which shows that as knowledge scores increase, the level of engagement in CaPB for young Black males increases. This relationship indicates that when younger Black males have a better understanding of domains pertinent to CaP and screening, such as limitations, side effects from treatments, symptoms, risk factors, screening age guidelines, and screening controversy, they are more likely to engage in behaviors that reduce their risk of CaP. Therefore, efforts made at improving engagement in CaPB in this special population could begin with assessing knowledge levels. The association found in the current study between knowledge and CaPB is similar to other study findings conducted in older Black males (Odedina et al., 2011b). The study by Horwood et al. (Horwood et al., 2014) had similar findings but reported that men were confused by conflicting messages in the media about dietary practices to promote overall health and preferred tailored dietary advice from their clinicians. While the current study did not assess source of information as a measure of cues to action, this could be a focal area of interest for future studies. Other studies have also shown the importance of increasing knowledge levels to aid adoptions of healthier cancer risk-reduction behaviors (Jepson et al., 2010; Kyle et al., 2013).

Compared to those in the less than high school category, engagement in risk-reduction behavior

reduced with increasing educational levels (in the college sophomore and college senior groups). While studies have not yet shown a direct relationship between educational levels and engagement in CaPBs, other findings have suggested that highly educated people tend to be more proactive about their health than those with low education levels (Arora and McHorney, 2000). More studies are needed to clearly understand the role of education on preventive behaviors, especially among college students.

Participants in professional and applied sciences programs had lower levels of engagement in preventive behaviors compared to those in the natural/healthcare sciences. An explanation for this is that those in the natural/healthcare sciences may be more proactive about engaging in CaPB because of their scholastic knowledge of healthy behaviors. However, it is likely that several interrelating factors such as income/finance, personal beliefs, and information seeking status may also be responsible for this finding (Ross et al., 2011). As a result, educational efforts can be designed to meet the knowledge needs of students from non-natural/healthcare science field to fill this gap.

Having a prolonged and constant source of care, which could be a proxy of sustained patient-provider communication, was a positive and significant predictor of engagement in CaPB. This can also mean that young Black men who have steady interactions with their healthcare providers might be receiving pertinent information which could inform their decisions to engage in risk-reduction behaviors. As a result, interventions aimed at improving engagement in CaPB could explore patient-provider communication and its impact on informed decision-making as it relates to future CaP screening practices. It is also more paramount given that patient-provider interaction plays a huge role in engaging in more relevant proactive behaviors, such as CaP screening (Berglund et al., 2005; Hoffman et al., 2010).

Age, cues to action, exercise, and family history of CaP were not significantly associated with CaPB in the overall regression model. However, a positive relationship has been demonstrated between cues to action and CaPB in a study conducted in older Black men (Odedina et al., 2011b). Thus, the insignificant relationship observed in the current study could be due to participants in this study being younger.

Several study limitations could have affected the interpretation and generalizability of the study results. The methodology utilized convenience sampling which limits the generalizability of study findings. Self-report surveys are also prone to selection and response bias. Since respondents self-reported their behaviors, it is possible that some of these were over- or underreported. Recall bias is also a limitation as some questions required participants to recall activities conducted within the previous week. Also, the research design was cross-sectional in nature. Thus study findings may not reflect causative relationships among variables of interest. Finally, other relevant variables of correlational interest, such as tobacco and alcohol use, were not assessed in the current study. Future studies could assess the impact of these variables. Future studies can also examine the impact of environmental factors, such as promotional campaigns, as potential cues in engaging in CaPB.

CONCLUSION

Few intervention-based studies have explored cognitive-behavioral factors in younger Black men

with the goal of raising awareness about CaPB. The current study highlights the importance of raising awareness in the younger population who may be at risk of CaP. Thus, interventional efforts aimed at targeting this at-risk group should focus on improving knowledge gaps. In this population, modifiable health behaviors can be targeted to help reduce the overall future incidence of CaP. The gains from an early start of behavior modification can help reduce the overall clinical, economic, and humanistic burden of CaP. A prospective cohort design in future studies tracking cognitive-behavior change among Black men (<40 years old) relative to CaP modifiable factors would illuminate which behaviors are easily amenable to change and what factors influence that change.

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Conflict of interest

The authors declare that no competing or conflict of interests exists.

Authors' contributions

Motolani Ogunsanya conducted the statistical analysis of the project and provided content and generated the initial draft of the article.Motolani Ogunsanya and Folakemi Odedina contributed to the acquisition of data. Folakemi Odedina, Ernest Kaninjing, Sunday Atawodi, Titilola Akinremi, and Anthonia Sowumni provided content and reviewed the final manuscript

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