



Discordance in perceived risk and epidemiological outcomes of prostate cancer among African American men

LaShanta J. Rice ^{a,j,*}, Melanie Jefferson ^a, Vanessa Briggs ^b, Ernestine Delmoo ^c, Jerry C. Johnson ^d, Sebastiano Gattoni-Celli ^{e,h}, Stephen J. Savage ^{f,h}, Michael Lilly ^{g,j}, Sandip M. Prasad ^{f,h}, Rick Kittles ⁱ, Chanita Hughes Halbert ^{a,h,j}

^a Department of Psychiatry and Behavioral Sciences, Medical University of South Carolina, 68 President Street, Suite BE103, Charleston, SC 29425, United States

^b Health Promotion Services, Public Health Management Corporation, Pennsylvania, 260 South Broad Street, Philadelphia, PA 19102, United States

^c Philadelphia Chapter, National Black Leadership Initiative on Cancer, 1415 N. Broad Street, Suite 221B, Philadelphia, PA 19122, United States

^d Department of Medicine, Division of Geriatrics, University of Pennsylvania, 3615 Chestnut St, Philadelphia, PA 19104-2676, United States

^e Department of Radiation Oncology, Medical University of South Carolina, Charleston, SC 29425, United States

^f Department of Urology, Medical University of South Carolina, Charleston, SC, United States

^g Department of Medicine, Division of Hematology/Oncology, Medical University of South Carolina, Charleston, SC, United States

^h Ralph H. Johnson Veterans Administration Medical Center, Charleston, SC, United States

ⁱ Department of Surgery, University of Arizona, Tucson, AZ, United States

^j Hollings Cancer Center, Medical University of South Carolina, Charleston, SC, United States

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ABSTRACT

As guidelines for prostate cancer screening have changed from an annual screening recommendation starting at age 50 to discussing the benefits and harms of screening with health care providers, it is necessary to examine other types of factors that are important to prostate cancer screening decisions among African American men. Perceived risk of developing cancer has been shown to predict cancer control behaviors and is lower among African Americans. We characterized perceived risk of developing prostate cancer among African American men from November 2009 to 2011 and evaluated the relationship between prostate cancer risk perceptions and sociodemographic characteristics, health care experiences, and knowledge and exposure to health information about cancer. Chi square tests and logistic regression were employed to determine independent associations. Overall, men did not believe they were at increased risk of developing prostate cancer; they believed their risk was equivalent to or lower than men the same age. Perceived risk of prostate cancer was associated with income (OR = 0.59, 95% CI = 0.26, 1.34, $p = 0.03$), hypertension (OR = 2.68, 95% CI = 1.17, 6.16, $p = 0.02$), and beliefs about the association between race and cancer risk (OR = 2.54, 95% CI = 1.24, 5.20, $p = 0.01$). Clinic and community-based approaches to improve prostate cancer risk comprehension among African American men are needed to reduce the discordance between perceived risk and epidemiological data on prostate cancer risk factors. Risk education interventions that are developed for African American men may need to integrate information about susceptibility for multiple diseases as well as address strategies for risk reduction and prevention, and chronic disease management.

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1. Introduction

Prostate cancer continues to disproportionately affect African American men in terms of morbidity and mortality. Several studies have examined knowledge, attitudes, and beliefs about prostate cancer screening (Steele et al., 2000; Forrester-Anderson, 2005; Blocker et al., 2006) and recent research has evaluated the effects of interventions that focus on enhancing informed decision-making about screening among African American men (Volk et al., 2007; Costanza et al., 2011).

This work has been important, but as guidelines for prostate cancer screening have changed from a recommendation to have annual screening to discussing the benefits and harms of screening with health care providers (Moyer, 2012), it is necessary to examine other types of factors that are important to prostate cancer screening decisions among African American men.

Perceived risk of developing cancer reflects the extent to which individuals believe that they are likely to develop disease (Gellman and Turner, 2013). Prior studies have shown that African American men may not believe that they are at increased risk for developing prostate cancer (Shavers et al., 2009), despite epidemiological data showing that they have a two to three times increased risk of developing and

* Corresponding author.

E-mail address: ricela@musc.edu (L.J. Rice).

dying from this disease (Gann, 2002; Bloom et al., 2006). Similar findings have been reported from qualitative studies, but this research also had a focus on early detection (Clarke-Tasker and Wade, 2001) and was conducted several years ago. Furthermore, since African American men are likely to die from other chronic conditions (e.g., diabetes and hypertension), the presence of these conditions may be important to what they believe about their risk of developing prostate cancer.

Recent work has shown that men who have diabetes are more likely to be screened for prostate cancer (Sanderson et al., 2013). African American men also have the highest rates of hypertension (Flack et al., 2015); hypertension is the most common comorbid disease among cancer patients (Piccirillo et al., 2004). Understanding prostate cancer risk perceptions within the context of other chronic conditions is important among African American men to identify factors that may impede or promote informed decision making about screening among these men.

The purpose of this study was to characterize perceived risk of developing prostate cancer among African American men. This is an important area of investigation because inaccurate risk perception may reduce the likelihood of initiating discussions about screening with providers or may reduce comprehension of the information that is provided about the benefits and harms of screening. Previous research shows that sociodemographic characteristics, health care experiences, and knowledge and exposure to health information about cancer is associated with perceived risk of developing cancer among African Americans (Katapodi et al., 2004; Halbert et al., 2014; Rice et al., 2015). Based upon this association, we evaluated the independent associations between these factors and prostate cancer risk perceptions among African American men and determined if beliefs about susceptibility differed based on men's personal history with a chronic condition.

2. Methods

2.1. Sample characteristics

This analysis is based on a larger sample that was involved in a health promotion intervention (Halbert et al., 2014). This study was conducted as part of an academic-community partnership that was established to address the health priorities and concerns of African American residents in an urban city (Halbert et al., 2014; Weathers et al., 2011). Eligible participants were individuals who self-identified as being African American, were ages 18–75, and were current residents in the Philadelphia, PA metropolitan area. Men below the age of 45 were included because African American men have a higher risk of prostate cancer (Merrill and Brawley, 1997) and prevalence of comorbid diseases (Go et al., 2014) below this age. In addition, research shows that undiagnosed prostate cancer is prevalent among men outside of the traditional age range for screening (e.g., 30 and 80 or above) (Jahn et al., 2015). Thirty-four percent of men in our study were under age 45. Residency was determined by self-report using zip code. Health status was obtained through self-report data. Individuals with a personal history of cancer and those who had ever had a heart attack, stroke, or heart disease were not eligible for participation. Women represented 57% and men made up 43% of study participants; a total of 198 men were included in this report. This study was approved by the Institutional Review Boards at the University of Pennsylvania and the Medical University of South Carolina.

2.2. Procedures

Participants were recruited into the study through self-referrals from community-based resources (Halbert et al., 2010; Halbert et al., 2014). Following self-referral, a screening interview was completed to determine eligibility; those who were eligible and provided verbal consent for enrollment completed a baseline telephone interview. The baseline telephone interview was a 30-minute structured survey. This interview was conducted by research assistants at the University of

Pennsylvania. At the end of the baseline telephone interview, participants were invited to attend a risk education intervention that focused on motivating changes in diet and physical activity. Those who accepted this invitation were randomized to one of two study arms: integrated risk education (INT) or disease-specific risk education (DSE). Detailed information about the interventions has been reported previously (Halbert et al., 2012). This report focuses on perceived risk reported at baseline prior to the intervention delivery because our primary outcomes were changes in dietary behaviors and physical activity.

2.3. Measures

2.3.1. Sociodemographic characteristics

Age, marital status, education (1 = 8 years or less, 2 = some high school, 3 = high school graduate, 4 = some college, and 5 = college graduate or beyond), employment status, and income were obtained by self-report using items from our previous research (Halbert et al., 2012). We re-coded these items into dichotomous variables based on the distribution of responses.

2.3.2. Family and medical history

Participants were asked if they had any first-degree relatives who had been diagnosed with cancer (yes or no). We also asked participants if they had ever been diagnosed with diabetes or hypertension (yes or no).

2.3.3. Health care resources

Participants were asked if they had health insurance coverage (yes or no) and where they usually received medical care (doctor's office versus other types of places).

2.3.4. Exposure to cancer information

We adapted an item from our previous research to examine exposure to information about cancer (Hughes et al., 1997). Specifically, participants were asked to indicate how much they had heard or read about cancer in African Americans (1 = almost nothing, 2 = a little bit, 3 = a fair amount, and 4 = a lot). Responses to this item were re-coded as almost nothing/a little bit versus a fair amount/a lot. We also asked men if they received health information from community resources (yes or no). Lastly, participants were also asked to indicate how much being a particular race or ethnicity and having a family history of cancer increases a person's chances of getting cancer (1 = a lot, 2 = a little, 3 = not at all, or do not know/no opinion). Since family history and African American race are established risk factors for prostate cancer and African American men have a 1 in 6 chance of developing this disease (American Cancer Society [ACS], 2016), we re-coded responses to these questions as a lot versus a little/not at all/do not know or no opinion.

2.3.5. Prostate cancer risk perception

We used one item to evaluate perceived risk of developing prostate cancer. Specifically, men were asked what their chances of getting prostate cancer were compared to other men their age (1 = much lower, 2 = lower, 3 = same, 4 = higher, and 5 = much higher). This item has been validated in prior reports (Lerman et al., 1995) and has been used to measure breast cancer risk perceptions in African American women (Hughes et al., 1996). As in previous research (Hughes et al., 1996), we re-coded prostate cancer risk perceptions into a dichotomous variable (much/little lower/same risk versus much/little higher risk) to identify men who had heightened perceived risk of developing this disease.

2.4. Data analysis

First, we generated descriptive statistics to characterize the study sample in terms of sociodemographics, medical history, health care

variables, knowledge and exposure to cancer information, and prostate cancer risk perceptions. We then conducted bivariate analyses using chi square tests of association to evaluate the relationship between risk perceptions and these variables. Next, we used logistic regression analyses to identify factors having independent associations with perceived risk of developing prostate cancer. Variables that had a bivariate association of $p < 0.10$ with perceived risk were included in the logistic regression model.

3. Results

Table 1 shows the characteristics of the study sample. Most participants were not married (89%), were high school graduates or had less education (58%), were not employed (64%), and had an annual household income that was less than \$20,000 (58%). The mean (SD) age of participants was 48 (9.0) years. In terms of health care variables, most participants had health insurance (72%) and usually received medical care in a doctor's office (62%). For medical history, 35% had a family history of cancer, 13% had diabetes, and 30% had hypertension. Fifty-nine percent of participants had heard or read a lot or a fair amount about cancer in African Americans and 35% reported that being a particular racial or ethnic group increased a person's chances of developing cancer a lot.

Overall, 28% of men reported that they were at high risk for developing prostate cancer and 72% indicated that they were at the same or lower risk of developing prostate cancer compared to men who were the same age. Table 1 shows the bivariate analysis of heightened perceived risk by sociodemographic, health care variables, medical history, and knowledge and exposure to information about prostate cancer. In general, men who had fewer socioeconomic resources were most likely to report that they had a high risk of developing prostate cancer. For instance, 36% of men who had an annual household income less than \$20,000 reported that they were at high risk for developing prostate

cancer compared to 18% of men whose incomes were greater than \$20,000. Similarly, 33% of unemployed men reported that they were at high risk compared to 18% of men who were employed. Men who perceived that they were at high risk for developing prostate cancer had a significantly higher age ($M = 50.3$, $SD = 7.7$) compared to those who believed that they were had a lower or same risk ($M = 47.2$, $SD = 9.4$) [$t = -2.18$, $p = 0.03$].

None of the health care variables had a statistically significant association with heightened perceived risk, but men who had a personal history of hypertension and those who had a family history of cancer were likely to report that they had a high risk of developing prostate cancer. Specifically, 37% of men who had a family history reported that they were at high risk compared to 23% of men who did not have a family history of disease. With respect to hypertension, 45% of men who had hypertension reported that they were at risk for developing prostate cancer compared to 21% who did not have hypertension. Men who believed that race/ethnicity is an important risk factor for developing cancer were more likely than those who believed that race/ethnicity was not an important risk factor to report that they were at high risk for developing prostate cancer.

The results of the multivariate logistic regression model of heightened perceived risk are provided in Table 2. Income, having a personal history of hypertension, and believing that race/ethnicity increases a person's chances of developing cancer a lot had significant independent associations with having a heightened risk perceptions. For instance, men who had hypertension were about three times more likely than those who did not have hypertension to believe that they were at high risk for developing prostate cancer ($OR = 2.68$, $95\% CI = 1.17, 6.16$, $p = 0.01$). Men who believed that race/ethnic background increases a person's chances of developing cancer a lot had an increased likelihood of reporting that they were at high risk for developing prostate cancer ($OR = 2.54$, $95\% CI = 1.24, 5.20$, $p = 0.01$). Although age did not have a significant association with heightened perceived risk, we re-ran the

Table 1
Sample characteristics and prostate cancer risk perception (n = 198).

Variable	Level	n (%)	% high risk	Chi square
Age	Mean (SD)	48 (9.0)		
Marital status ^a	Married	22 (11%)	14%	2.47
	Not Married	176 (89%)	30%	
Education level	≥Some college	84 (42%)	27%	0.01
	≤High school graduate	114 (58%)	28%	
Employment status ^a	Employed	70 (36%)	18%	4.86*
	Not employed	126 (64%)	33%	
Income level ^a	>\$20,000	81 (43%)	18%	7.24**
	<\$20,000	107 (57%)	36%	
Health insurance ^a	Yes	141 (72%)	31%	2.66‡
	No	56 (28%)	20%	
Medical care	Doctor's office	122 (62%)	33%	3.97*
	Other	76 (38%)	20%	
Family history of cancer in first-degree relative	Yes	70 (35%)	37%	4.73*
	No	128 (65%)	23%	
Diabetes	Yes	25 (13%)	32%	0.25
	No	173 (87%)	27%	
Hypertension	Yes	58 (29%)	45%	11.89***
	No	140 (71%)	21%	
Exposure to information about cancer and African Americans	A lot/fair amount	117 (59%)	26%	0.23
	Almost nothing/a little bit	81 (41%)	30%	
Community health information	A lot	77 (40%)	26%	10.06***
	A little/none	115 (60%)	30%	
Race and cancer risk	A lot	70 (35%)	41%	10.06**
	A little/not at all/do not know	128 (65%)	20%	
Family history and cancer risk	A lot	146 (75%)	29%	0.26
	A little/not at all/do not know	48 (25%)	25%	

^a n < 198 because of the small amount of missing data.

*** p < 0.001.

** p < 0.01.

* p < 0.05.

‡ p < 0.10.

Table 2
Multivariate logistic regression model of heightened prostate cancer risk perception (n = 186) from November 2009 to 2011.

Variable	Level	OR	95% confidence interval	p-Value
Employment status	Employed	0.59	0.26, 1.34	0.21
	Not employed			
Income level	>\$20,000	0.42	0.19, 0.92	0.03
	<\$20,000			
Age***		0.90	0.59, 1.36	0.62
Health insurance	Yes	1.01	0.42, 2.44	0.98
	No			
Family history of cancer	Yes	1.32	0.64, 2.75	0.45
	No			
Hypertension	Yes	2.68	1.17, 6.16	0.02
	No			
Medical care	Doctor's office	2.01	0.90, 4.48	0.09
	Other			
Race and cancer risk	A lot	2.54	1.24, 5.20	0.01
	Other			

*** OR for continuous variables represent 1 SD unit change.

logistic regression model excluding men who were under age 45. The associations between risk perceptions and hypertension were attenuated (OR = 2.40, 95% CI = 0.98, 5.89, p = 0.06) as was the association with beliefs about race/ethnicity and cancer (OR = 2.17, 95% CI = 0.95, 4.92, p = 0.07), but the magnitude of the ORs were not reduced considerably.

4. Discussion

African American race is an established risk factor for developing prostate cancer (Gann, 2002). Despite this, only 28% of African American men in our study believed that they were at high risk of developing this disease. Perceived risk is an important variable for cancer prevention and control; prior studies have shown that greater perceived risk is associated with increased utilization of cancer screening tests (Dillard et al., 2010). Currently, prostate cancer screening has a grade D recommendation from the US Preventive Services Task Force (Moyer, 2012), but early detection may still be beneficial among African American men because of their increased risk of disease (ACS, 2016). In this study, we examined the nature and distribution of perceived risk of developing prostate cancer among African American men. Seventy-two percent of men reported that they had the same or lower risk of developing prostate cancer compared to men their age. Age did not have a significant association with heightened perceived risk of developing prostate cancer; this could be because men under age 45 were included in our sample. However, a similar proportion of men ages 45 and older reported that they were at high risk for developing prostate cancer (32%) and the magnitude of the OR for variables was consistent in this sub-group analysis. Consistent with results from other studies (Shavers et al., 2009), our findings show a significant disconnect between the epidemiology of prostate cancer and risk perception among African American men.

We found that men who believed that being a particular racial or ethnic group increases a person's chances of developing cancer a lot was associated with a 2.54-fold greater likelihood of reporting a heightened perceived risk of developing prostate cancer. But, neither exposure to information about race and cancer nor obtaining health information from community resources were associated significantly with having a heightened perceived risk of developing prostate cancer. This finding is unexpected because more than half of men in our study reported a lot or a fair amount of exposure to information about race and cancer. In contrast, only 35% of men reported that race/ethnicity was an important risk factor for developing cancer even though African American men have a higher incidence and mortality rate for most forms of cancer, in addition to having an increased risk of developing prostate

cancer, compared to non-Hispanic white men (ACS, 2016). Prior studies have attempted to increase exposure to information about prostate cancer and enhance knowledge about screening through barbershops and other community venues where African American men are likely to congregate socially (e.g., churches) (Holt et al., 2009; Drake et al., 2010; Luque et al., 2011). These types of community-based efforts are important, especially in light of recent research which has shown that social capital is positively associated with prostate cancer screening among African American men (Dean et al., 2014). Our findings suggest that these efforts may also need to specifically address prostate cancer risk factors as well as the importance of race and cancer risk.

Considerable efforts have been made to improve cancer risk comprehension among women who have breast cancer risk factors (Lerman et al., 1995; Lerman et al., 1996; Schwartz et al., 1999; Vernon, 1999), but to our knowledge, comparable efforts have not been made to address prostate cancer risk comprehension among African American men. Prior studies have focused on increasing informed decision making about screening using interventions that address risk factors for disease (Drake et al., 2010; Allen et al., 2009; Edwards et al., 2013). But, it may be important to focus these interventions specifically on risk comprehension rather than screening decisions alone. We also found that men who had hypertension were also more likely to report that they were at high risk for developing prostate cancer. This could be because men who have hypertension have a greater number of interactions with health care providers as part of treating and managing this disease. At a minimum, hypertensive patients should see a health care provider twice per year (Chobanian et al., 2003); providers may also discuss other disease risks during these clinic visits. However, recent research has shown that health care providers are not likely to elicit patient's perspectives about prostate cancer screening after a brief intervention that was designed to promote shared decisions (Feng et al., 2013). Educational interventions could address prostate cancer risk comprehension using evidential information about this disease among African American men; our findings suggest that it may be important to integrate this evidence with information about other chronic conditions such as hypertension. Ravenell et al. (2013) evaluated the effects of interventions that address disparities in hypertension and colorectal cancer simultaneously among African American men. Recently, we found that African American men were likely to complete a health promotion intervention that provided education about risk factors for several types of cancer and cardiovascular disease (Halbert et al., 2014). Other research has shown that African Americans who receive evidential content or information about cancer that is specific to the risk and outcomes of disease among African Americans have high levels of engagement and cognitive processing of information (Thompson et al., 2008).

The lack of prostate cancer risk education among African American men may be because of the uncertainty of the benefits of prostate cancer screening tests; accordingly, public health and clinical efforts may now be conservative in terms of promoting prostate cancer screening. This is reflected in the changes made to the focus and content of interventions that address prostate cancer. Prior to the change in prostate cancer screening guidelines, interventions focused on the promotion and delivery of prostate cancer screening but now interventions focus on enhancing informed decision making about whether or not to have screening (Lepore et al., 2012). Clearly, knowledge about prostate cancer and screening strategies is important to informed decision-making, but perceived risk reflects the extent to which one believes that they are likely to be diagnosed with and impacted by a disease. Men who do not believe that they are at risk for developing prostate cancer may be unlikely to initiate or participate in shared decision making about prostate cancer screening. Our findings demonstrate a need for clinic and community-based approaches to improve prostate cancer risk comprehension among African American men; these strategies may be effective at reducing the discordance between perceived risk and epidemiological data on prostate cancer risk factors. Additional research is needed to

evaluate the effects of alternate strategies for communicating information about prostate cancer risk to African American men on risk comprehension and informed decision making about screening. As part of this research, it is also important to identify the most effective venues for delivering this information. Community-based efforts for risk factor education and comprehension could be used as a precursor to prepare men to discuss their risk factors, whether they believe they are at risk for developing prostate cancer, and how much these perceptions influence their decisions about screening with health care providers.

In considering the results of this study, some limitations should be noted. First, this was a cross-sectional analysis of prostate cancer risk perceptions and we did not evaluate the relationship between risk perceptions and screening or constructs that are important to informed decisions about screening. An additional limitation may be that we only evaluated comparative risk perception using one Likert-style item. This approach may not reflect all of the ways in which African American men assess their subjective risk of developing prostate cancer and does not provide an assessment of men's absolute perceived risk. However, definitive data on the best methods for evaluating risk perception is not yet available (Vernon, 1999) and a recent study demonstrated that there is a high degree of correlation among different types of risk perception measures (e.g., comparative, numerical, verbal risk perception measures) (Levy et al., 2006). Nonetheless, additional research is needed to determine the most effective ways of evaluating prostate cancer risk perceptions among African American men. Another possible limitation is that data on family and medical history were collected by self-report, which may be subject to recall bias. Since we did not evaluate racial group differences in prostate cancer risk perceptions, future studies are also needed to determine if these perceptions differ between African American and white men.

Despite these potential limitations, our research provides novel information about perceived risk of developing prostate cancer among men who are most susceptible to developing this disease. We found a significant discordance between African American men's perceived risk of developing prostate cancer and epidemiological data about risk factors for this disease. Risk education programs that provide information about factors that increase a man's risk of developing prostate cancer may be one way to address this disconnect, especially if they incorporate evidential content about this disease among African American men and validated prostate cancer risk assessment tools to provide objective risk estimates. Importantly, risk education interventions that are developed for African American men may need to integrate information about susceptibility for multiple diseases as well as address strategies for risk reduction and prevention, and chronic disease management.

Authors' statement of conflict of interest and adherence to ethical standards

Authors Rice, Jefferson, Briggs, Delmoor, Johnson, Gattoni-Celli, Savage, Lilly, Prasad, Kittles, and Hughes Halbert declare that they have no conflict of interest. All procedures, including the informed consent process, were conducted in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2000.

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