Prostate Cancer Screening Behavior in Men from Seven Ethnic Groups: the Fear Factor

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Abstract

Rates of prostate cancer screening are known to vary among the major ethnic groups. However, likely variations in screening behavior among ethnic subpopulations and the likely role of psychological characteristics remain understudied. We examined differences in prostate cancer screening among samples of 44 men from each of seven ethnic groups (N = 308; U.S.-born European Americans, U.S.-born African Americans, men from the English-speaking Caribbean, Haitians, Dominicans, Puerto Ricans, and Eastern Europeans) and the associations among trait fear, emotion regulatory characteristics, and screening. As expected, there were differences in the frequency of both digital rectal exam (DRE) and prostate-specific antigen (PSA) tests among the groups, even when demographic factors and access were controlled. Haitian men reported fewer DRE and PSA tests than either U.S.-born European American or Dominican men, and immigrant Eastern European men reported fewer tests than U.S.-born European Americans; consistent with prior research, U.S.-born African Americans differed from U.S.-born European Americans for DRE but not PSA frequency. Second, the addition of trait fear significantly improved model fit, as did the inclusion of a quadratic, inverted U, trait fear term, even where demographics, access, and ethnicity were controlled. Trait fear did not interact with ethnicity, suggesting its effect may operate equally across groups, and adding patterns of information processing and emotion regulation to the model did not improve model fit. Overall, our data suggest that fear is among the key psychological determinants of male screening behavior and would be usefully considered in models designed to increase male screening frequency. (Cancer Epidemiol Biomarkers Prev 2006;15(2):228–37)

Prostate cancer is the second leading cause of cancer death among American men (1); there are striking ethnic differences in both its incidence and mortality (2). Compared with both European American (172.9 of 100,000) and Hispanic men (127.6 of 100,000), African American men (275.3 of 100,000) have the highest incidence of prostate cancer in the United States (3) and more than twice the mortality rate of European Americans (2). Conversely, although the incidence rates between 1995 and 1999 were ~20% lower among Hispanic men, prostate cancer remains the most commonly diagnosed cancer and the second leading cause of cancer death within this group (4).

Scientists know almost nothing about prostate cancer in Caribbean subpopulations. Research has, however, indicated that Jamaican men (who are often classified as ''African American'') may have an incidence rate that *exceeds* that of U.S.-born African Americans. One study of 2,484 men in Trinidad and Tobago, a major source of English-speaking Caribbean immigrants to the United States, suggested that the rate of prostate cancer may be as high as 10% (5), with a high number of abnormal screening findings (6). Research in Kingston, Jamaica likewise suggests that the incidence may be as high as 304 of 100,000 (7).

A major part of ethnic differences in mortality may result from ethnic differences in the stage of diagnosis (8); disparities are more striking for advanced tumors (3, 9). African American men are more likely to be detected with metastatic cancer (10) and are at greater risk even after adjusting for socioeconomic status, year, and age at diagnosis (11). Hispanic men are also more likely to be diagnosed with distant-stage cancers (4). Stage of presentation is a major determinant of survival (12) with estimates suggesting that 5-year survival for local and regionally advanced prostate cancers is almost 100%, whereas that for distant disease is 34% (2).

Because of the complexity of prostate cancer biology and debate over the efficacy of prostate-specific antigen (PSA) screening (13, 14), doubt remains regarding whether the poorer survival of African American men reflects their later stage at diagnosis or differences in basic disease biology (15, 16): genetic, environmental, or social factors (17). However, one of the largest analyses (18) showed epidemiologic changes in the Surveillance, Epidemiology, and End Results data from 1973 to 1994 consistent with an interpretation of PSA testing as being effective. In the absence of definitive evidence to the contrary, the American Cancer Society suggests that every man over the age of 50 be offered screening with an annual digital rectal exam (DRE) and PSA test (1) as long as men are informed regarding the benefits and limitations of these methods (19).

Estimates suggest that African American (57.6%) and White (58.2%) men participate in PSA testing with similar frequency, although DRE rates are lower among African Americans (20). However, fewer than half of the Hispanic male population received a PSA or DRE test in 2001 (4). Screening rate differences have been associated with later stage diagnoses (21), and it has been shown that although >70% of prostate cancers among Black and White men are detected by *screening*, nearly 50% of prostate cancers among Hispanic men are detected due to *symptoms* (22).

Sociodemographic characteristics and access issues have been considered a primary explanation for late stage diagnosis and screening rate differences (23, 24). Screening has been associated with race/ethnicity, education and socioeconomic

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status (25, 26), a lack of insurance (12, 27), lower age (28-30), being single (27), with reports of time, access, and awareness problems (31-33), and with low levels of physician recommendation (26, 34). There are, however, two good reasons to consider variables beyond these in understanding differences in prostate cancer screening.

First, the tendency for researchers to group individuals from minority groups within general racial rubrics, such as ''White,'' ''Black,'' and ''Hispanic'' (35, 36), assumes little variation *within* groups (37). However, ethnic categories, such as ''African American,'' are frequently arbitrary, in many cases encompassing U.S.-born African Americans as well as immigrants from Africa and individuals of African descent from the West Indies (38, 39). Similar diversity exists within the global Hispanic grouping (36, 40, 41). In the current study, we considered prostate screening behavior among men from seven distinct ethnic groups, contrasting U.S.-born African and European men with men from five immigrant groups: Caribbean immigrants from the English-speaking territories, Haitians, Dominicans, Puerto Ricans, and Immigrant Eastern Europeans. Consistent with our breast cancer screening research among these populations, we expected considerable variation in prostate cancer screening behavior among men from these groups. Furthermore, because ethnic differences in screening persist even when demographic predictors are controlled (29), we expected that these differences would remain even when demographic variables and perceptions of access were controlled.

Because demographic differences do not explain ethnic differences, prostate screening researchers have begun to consider the role of psychological factors. The psychosocial approach remains strongly cognitive in orientation, and it has been shown that greater knowledge (31, 42), beliefs in screening efficacy (43), and susceptibility predict levels of prostate cancer care (44), and greater self-efficacy may also predict increased screening (45). Focus group work likewise suggests that outcome beliefs, knowledge, and perceptions of susceptibility and threat may relate to screening behavior among African Americans (46).

Missing from this developing picture thus far, however, is a systematic examination of the emotion and emotion regulatory variables that breast cancer screening research has suggested may be critical to understanding screening in diverse populations (47, 48). One study examined prostate cancer worry in relation to prostate screening, although it focused on differences between symptomatic and asymptomatic men (49). Another study suggested that greater worry and concern about *screening* rather than prostate cancer per se predicted self-care versus no care, although it was not related to conventional care measures (44). A third study found that concern over developing prostate cancer was associated with the use of prostate-related complementary and alternative medicines (50).

The question of exactly how emotions, particularly fear/anxiety, relate to health-related behaviors is, however, complex (51). On the one hand, fear of cancer, the medical establishment, and finding something wrong have been linked to poorer screening (52-59). Conversely, however, it has also been shown that greater fear is associated with more frequent screening (48, 60–63). A recent review that examined fear in the context of breast screening concluded that where fears pertain directly to the screening process (e.g., fear of pain) or outcomes (fear of ''getting cancer''), avoidance of the fear-inducing situation will occur and screening will be infrequent. However, as in the current study, when comparatively undifferentiated or trait-like fear is assessed and there is a possibility that the screening process will reduce anxiety, greater fear is generally facilitative of screening (51, 64).

Making matters more complex is the fact that emotions like anxiety infrequently occur in an unregulated state (65). As is implied above, screening behaviors may sometimes represent part of a regulatory response to certain classes of anxiety or threat. In addition, however, the means by which people regulate anxiety or threat more generally are likely to have implications for their screening behavior. In breast screening research, a restrictive style of regulating emotion (denial) has been linked to delays in responding to symptoms (61, 66, 67), perhaps suggesting that avoidance of anxiety will negatively affect screening. However, a closely related style involving dissociation from felt anxiety (repression) has been linked to greater screening (48, 68), creating the possibility that a degree of avoidance may *promote* screening when it brings anxiety within manageable limits. Indeed, consistent with this thesis, one recent study of 6,512 women found that women with *moderate* worry were significantly more likely to report an annual mammogram than those who reported either mild or severe levels (69).

The current study examined the contribution of four emotion-related personality variables, one related to dispositional emotional experience (trait fear/anxiety), two related to dispositional styles of regulating emotions (emotional expressivity and inhibition), and one related to styles of dealing with threatening information (monitoring/blunting). Consistent with other screening studies (48), and the notion that people who avoid threatening situations, such as prostate screening, also tend to avoid negative emotion, we expected that trait fear and emotional expressivity would predict greater screening, and emotion inhibition lower screening, even when demographics, access, and ethnicity were controlled. Conversely, we expected that a greater tendency to monitor the environment for health threats should be associated with increased screening, again, even when demographics, access, and ethnicity were controlled. Finally, and although the absence of a coherent literature prevented the formation of hypotheses, we were interested in examining both (*a*) the possibility of nonlinear effects in the relation between fear and screening and (*b*) whether or not fear would continue to predict screening once regulatory styles were controlled.

Materials and Methods

Participants. Participants in this study were 308 men, ranging in age from 50 to 70 years, living in New York, and recruited for a study on ''Emotions and Health.'' We distinguished between U.S.-born African Americans and Caribbean immigrant men who were from (*a*) the English-speaking territories (e.g., Barbados, Trinidad and Tobago, and Jamaica), (*b*) the Spanish-speaking part of Hispaniola (the Dominican Republic), (*c*) the Creole-speaking part of Hispaniola (Haiti), and (*d*) Puerto Rico. U.S.-born European Americans served as the reference group, and immigrants from Eastern Europe served as a White immigration control group. This latter sample was made up of men from countries of the former United Soviet Socialist Republic including Russia, Ukraine, and Belarus, all Russian-speaking Eastern Slavs. As Eastern Slavs, these men are ethnically similar (70, 71) and, for the purposes of the current study, were combined to yield a sample size comparable with the other ethnic groups. There were 44 men from each ethnic group. The average age of the sample was 58.6 years, and they reported an average household income of approximately US$35,000. Men reported an average of 12.4 years of education (slightly greater than high school), and the immigrant men reported having resided in the United States for an average of 26.69 years.

Procedures. Permission to conduct the study was obtained from the Long Island University Institutional Review Board; data were collected for 2 years in 2002 to 2004. Men were recruited through local newspapers, community postings, and at health fairs and senior centers. Data were collected by

trained interviewers fluent in the native language of the participant; Dominicans and Puerto Ricans were interviewed in Spanish, Haitians in Creole, and Eastern Europeans in Russian; informed consent was obtained from all participants. For the non–English-speaking samples, instruments were translated into Spanish, Creole, and Russian and then, consistent with standard ethnographic practice, back-translated to ensure comparability. Measures were administered in a standard order for all respondents, and participants were paid US$20 for their involvement.

Measures

Background Questionnaire. A questionnaire elicited information regarding self-reported ethnic group membership, age, household income, and education.

Prostate Cancer Screening Behavior and Perceptions of Access. A second questionnaire included questions pertaining to prostate cancer screening behaviors, specifically the number of DREs and PSA tests in the prior *10 years* and assessed the perceived accessibility of these two screens. Although most research asks men to report on screening within the last 12 months or to report on their most recent screen, we were concerned that (*a*) the particularly low rates among our samples of immigrant, minority men would produce too many ''nonscreeners'' and would thus not do justice to the variation within each group, and (*b*) that a convenience sampling technique that included recruitment at health fairs would produce an unnatural number of men whose most recent screen was conducted at the recruitment site itself. The concordance between self-report and medical audit measures of cancer screening is generally adequate, with discrepancies attributable to both self-report and chart entry errors. Self-reported frequency of prostate cancer screening is generally higher than that indicated by charts (72), and some reports have indicated discrepancies in nearly 30% (73). Because of the non-normal distribution of screening behavior and the discrepancy between self-report and chart audits based on short time frames (i.e., within the last 12 months, most recent screen), we felt that continuous data representing behavior over a longer time period allowed for more sensitive and sophisticated analyses than discrete (screen/not screen) measures. As was expected, the screening data were positively skewed (skewness = 1.77 for PSA and 1.66 for DRE) and were improved with a standard square root transformation (74). Additionally, men answered questions asking them how readily accessible DRE and PSA screens were to them on a scale from 1 (not at all accessible) to 5 (extremely accessible). For ease of interpretation, both DRE and PSA access scores were recorded such that a higher score indicates the perception of greater access.

Trait Fear/Anxiety. Dispositional fear/anxiety was measured with the fear subscale of the Differential Emotions Scale (75). The fear subscale has three items on which respondents rate, on a scale of 1 to 5, the extent to which the emotion characterizes their *day-to-day experience*. The scale has been used in numerous investigations on emotion in older minority groups (37) and enjoys good psychometric properties (75, 76). In the current study, we summed the three fear items to form an aggregate measure of trait fear/anxiety ($\alpha = 0.79$).

Monitoring/Blunting. To assess the degree to which participants engaged in monitoring or blunting coping strategies in the face of threat-related cues, we used an abridged version of the Monitoring-Blunting Style Scale (77), in which the most health relevant of the original four scenarios, the dentist vignette, was presented. Presentation of this scenario was followed by eight statements representing different strategies for dealing with the event. Four statements relate to monitoring strategies (e.g., ''I would ask the dentist exactly what work was going to be done''), whereas four are of a distracting/blunting variety (e.g., ''I would try to think about pleasant memories''). Consistent with prior research (78-80), a composite monitoring/blunting score was derived by subtracting the blunting score from the monitoring score. Higher monitoring/blunting scores indicate a greater information-seeking tendency (78).

In its original form, the Monitoring-Blunting Style Scale asks individuals to imagine four hypothetical stress evoking and highly uncontrollable scenes and has been reliably related to health behavior (81, 82), including both breast (83) and cervical screening frequency (78). Although we are aware of no test-retest information for abridged versions, those for the full scale typically average around 0.80 over 3 months (84) and 6 months (83), with an internal reliability of ≥ 0.70 (77). However, more recent research has validated the use of shorter versions, using the dentist and job loss scenarios (85) and the dentist and airplane scenarios, respectively (79). Given demands on participant time during recruitment, the current study administered the dentist scenario as being the most overtly health-related of the four situations. Ongoing work in a comparable sample of 64 African American and 58 White, middle-aged women ($N = 122$, $M_{age} = 48.42$ years, $M_{income} = US\$33{,}800$) shows that scores from the dentist scenario correlate at 0.75 (monitoring) and 0.65 (blunting) with the full measure, suggesting the abridged version is a reasonable approximation to the full measure.

Trait Emotion Regulation: Inhibition and Expressivity. Trait inhibition and expressivity were assessed with the Present Personality Questionnaire, a 24-item measure that assesses trait expressive and inhibitory tendencies (37). The 12 inhibition-scale items include statements such as ''I try not to let my anxieties show,'' ''I tend to suffer in silence when I am worried,'' and ''I have difficulty expressing my anger'' and were combined to form an aggregate inhibition measure ($\alpha = 0.85$). Similarly, the 12 expressivity-scale items include statements such as ''When I get worried I really show it,'' ''Friends know it when I get irritated,'' and ''When I feel sad I talk with a friend'' and were combined to form an aggregate expressivity measure ($\alpha = 0.84$).

Analytic Strategy. Analysis proceeded in two stages. First, we conducted descriptive MANCOVAs and follow-up MANOVAs to examine ethnic group differences in demographics, prostate cancer screening, and the five psychological variables. Second, we considered whether trait fear/anxiety, trait expressivity, inhibition, and monitoring/blunting tendencies predicted DRE and PSA screening over and above demographics, access, and ethnicity. In this analysis, we ran two four-step multiple regressions predicting the square root–transformed DRE and PSA frequency in which demographic variables, perceived access, and ethnic dummy codes (using U.S.-born European American men as a reference group) were entered in the first step. In the second step, we added trait fear/anxiety, and the quadratic fear term (centered fear squared) was added in the third step. Finally, the emotion-regulatory (trait inhibition and expressivity) and composite monitor/blunter score were added in the final step.

Results

Demographic Characteristics of the Sample. Table 1 displays the demographics of the sample broken down by ethnicity and the results of univariate ANOVAs or χ^2 tests. There were significant ethnic differences on age, household income, and education; these factors were treated as covariates in subsequent analyses.

Ethnic Group Differences in Screening and Access. A MANCOVA, with ethnic group as the independent variable, frequency of PSA and DRE and access perceptions for each as dependent variables, and age, income, and education as covariates, was run. The model was significant for ethnicity (Wilks' $\lambda = 2.66$, $P < 0.01$). However, age and income were also

Table 1. Demographic background by ethnic group and results of follow-up ANOVA

Variables	African American (n = 44)	English Caribbean (n = 44)	Haitian (n = 44)	Dominican (n = 44)	Puerto Rican (n = 44)	Eastern European (n = 44)	European American (n = 44)	F	Post hoc comparisons
Age	55.7 (5.3)	58.1 (5.6)	58.0 (6.1)	57.6 (5.3)	58.6 (6.1)	61.7 (6.3)	60.4 (5.2)	5.2*	EE, EA>AA; EE>D
Household Income (US$K)	20.7 (18.9)	33.3 (28.0)	43.8 (18.9)	29.0 (20.8)	25.8 (23.4)	30.4 (34.4)	60.4 (48.2)	9.2*	EA > AA, EC, D, PR, EE; H > AA, D, PR
Education (y)	12.9 (2.4)	12.6 (3.8)	11.4 (3.6)	9.5 (3.9)	10.0 (6.2)	14.4 (3.2)	16.1 (3.9)	15.2*	EA > AA, EC, H, D, PR; EE > H, D, PR; AA, EC > D

Abbreviations: AA, African American; EC, English Caribbean; H, Haitian; D, Dominican; PR, Puerto Rican; EE, Eastern European; EA, U.S.-born European American.
*$P < 0.01$.

significant; hence, they were dichotomized and entered into a MANOVA with ethnicity, age, and income as factors and the two screening and two attitude measures as dependent variables. Ethnicity was again significant (Wilks' λ = 3.05, $P < 0.01$) as was income (Wilks' λ = 3.01, $P < 0.01$); age, however, was not and, to conserve power, was dropped from the model. Finally, we ran an ethnicity by income MANOVA. Ethnicity was significant (Wilks' λ = 2.87, $P < 0.01$) as was income (Wilks' λ = 3.10, $P < 0.01$). Follow-up tests showed that greater income was associated with reports that both PSA [$F(1, 294) = 4.18$, $P < 0.05$] and DRE tests were more accessible [$F(6, 294) = 3.62$, $P < 0.01$], whereas ethnicity was associated with number of PSA tests [$F(6, 294) = 3.62$, $P < 0.01$], number of DRE tests [$F(6, 294) = 5.44$, $P < 0.01$], PSA access scores [$F(6, 294) = 4.18$, $P < 0.01$], and DRE access scores [$F(6, 294) = 4.29$, $P < 0.01$; see Table 2].

Ethnic Group Differences in Trait Fear, Emotion Regulation, and Monitoring/Blunting. Finally, we examined group differences in the psychological variables of interest. A MANCOVA, with ethnic group as the independent variable, the four psychological variables as dependent variables, and age, income, and education as covariates, was run. With no significant covariates, a MANOVA with ethnicity was then run. Ethnicity was significant (Wilks' $\lambda = 2.84$, $P < 0.01$), with follow-up tests showing effects of trait fear/anxiety [$F(6, 301) = 7.15$, $P < 0.01$], the monitoring/blunting composite [$F(6, 301) = 2.40$, $P < 0.05$], and expressiveness [$F(P6, 301) = 3.43$, $P < 0.01$; see Table 2]. The levels of fear reported by these men are perhaps slightly higher than those found in our early community sampling work in diverse populations (86), a finding we suspect may reflect to the fact that a proportion of the current sample was recruited and interviewed when at health fairs and clinics, whereas the earlier sample was primarily interviewed in homes and others nonmedical settings (86).

Zero-Order Relations between Psychological Characteristics and Screening. In beginning to examine whether trait emotion, emotion regulation, and information processing style predicted male screening, we first examined the zero-order relations among the variables. As can be seen in Table 3, PSA and DRE frequencies were positively related to one another as well as to perceptions of access. In addition, however, both DRE and PSA frequencies were positively related to trait fear and to dispositional emotion expressivity; greater monitoring tendencies predicted DRE but not PSA frequency.

Predicting DRE Screening with Trait Fear and Emotion Regulation. As can be seen in Table 4, the initial model predicting DRE frequency was significant [$F(9, 298) = 6.02$, $P < 0.01$] and explained 15.4% of the variance in self-reported DRE screening. Poorer DRE screening was predicted by younger age, perceptions of lower DRE access, and by being African American, Haitian, Puerto Rican, or Eastern European. Adding trait fear/anxiety in step 2 produced a significant model [$F(10, 297) = 6.05$, $P < 0.01$], with an additional 2% of the variance in DRE frequency accounted for [$F\Delta(1, 297) = 5.54$, $P < 0.05$]. Being younger, African American, Haitian, Puerto Rican, or Eastern European continued to predict poorer screening, and less income became a predictor. As expected, fear predicted DRE screening with an effect size similar to that of classic demographic predictors, such as age and income.

To examine the possibility that fear might relate nonlinearly to DRE screening, we added a quadratic fear term (centered fear squared) in a third step. The model was significant [$F(11, 296) = 5.92$, $P < 0.01$], with a further 1% increase in variance explained [$F\Delta(1, 296) = 3.97$, $P < 0.05$]. There were no other changes to the model. Consistent with some earlier work (69), the quadratic fear term was significant, a finding that we consider in greater detail below. Finally, in examining whether fear affected screening even when differences in regulatory styles were controlled, we added the composite monitoring/blunting score and trait inhibition and expressivity in the final step. Although the model was significant

Table 2. Screening frequency and access estimates by ethnic group and results of follow-up ANOVA

Variables	African American (n = 44)	English Caribbean (n = 44)	Haitian (n = 44)	Dominican (n = 44)	Puerto Rican (n = 44)	Eastern European (n = 44)	European American (n = 44)	F	Post hoc comparisons
No. PSA tests*	3.3 (3.9)	3.9 (4.3)	2.0 (2.2)	4.7 (5.1)	3.1 (3.4)	2.7 (3.5)	5.6 (5.0)	3.56†	H < D, EA; EE < EA
No. DRE tests*	2.0 (2.4)	3.3 (3.5)	1.6 (2.3)	4.4 (4.1)	2.7 (4.4)	2.3 (3.1)	5.6 (5.1)	5.33†	AA, H < D, EA; EE < EA
PSA access	3.9 (.9)	4.2 (.8)	3.6 (.8)	3.5 (1.2)	3.6 (1.2)	3.6 (1.0)	4.3 (.9)	3.08†	EA > H, D, PR, EE; EC > D, H
DRE access	3.8 (.9)	4.1 (1.0)	3.5 (.8)	3.2 (1.3)	3.8 (1.2)	3.5 (1.1)	4.1 (1.1)	3.43†	EA > H, D; EC > D
Fear/anxiety	7.00 (2.28)	5.50 (2.56)	3.95 (2.17)	5.86 (2.70)	6.59 (2.97)	6.34 (2.28)	6.57 (2.65)	7.20†	H < all
Monitor/blunt	0.75 (1.43)	1.02 (1.61)	0.52 (1.00)	1.18 (1.53)	1.05 (1.40)	0.77 (1.34)	1.52 (1.44)	2.40‡	EA > H
Inhibition	29.7 (7.4)	26.0 (8.7)	26.1 (10.9)	27.5 (5.2)	28.9 (8.5)	29.9 (5.7)	28.7 (7.2)	1.82	—
Expressivity	32.1 (7.7)	31.5 (9.0)	26.9 (7.6)	30.9 (8.2)	32.5 (10.2)	29.4 (7.0)	33.9 (7.4)	3.43†	H < AA, EA

Abbreviations: AA, African American; EC, English Caribbean; H, Haitian; D, Dominican; PR, Puerto Rican; EE, Eastern European; EA, U.S.-born European American.
*Represents number of tests in previous 10 years.
†$P < 0.01$.
‡$P < 0.05$.

Table 3. Zero-order correlations among study variables

Variables	Age	Income	Education	No. DRE in 10 y	No. PSA in 10 y	DRE Access	PSA Access	Fear	Monitor/blunter composite	Inhibition	Expressivity
Age	—	−0.12*	−0.17†	0.15†	0.15†	−0.00†	0.01†	−0.07	0.12†	−0.01	−0.09
Income		—	0.43†	0.16†	0.11	0.23†	0.21†	−0.09	−0.02	−0.09	−0.02
Education			—	0.08	0.08	0.21†	0.21†	0.04	−0.07	−0.08	0.06
No. DRE in 10 y				—	0.72†	0.15†	0.22†	0.13*	0.11*	0.07	0.17†
No. PSA in 10 y					—	0.15†	0.23†	0.12*	0.01	0.03	0.17†
DRE access						—	0.75†	0.04	0.02	−0.02	0.11*
PSA access							—	0.05	0.11*	0.00	0.08
Trait fear								—	0.10	0.40†	0.47†
Monitor/blunter composite									—	0.03	0.10
Inhibition										—	0.27†
Expressivity											—

*$P < 0.05$.
†$P < 0.01$.

[$F(14, 293) = 5.14$, $P < 0.01$], and nearly 2% additional variance was gained, the change in variance explained was marginal [$F\Delta(3, 293) = 2.06$, $P = 0.11$]. However, adding the emotion regulatory variables removed the effects for being African American and Haitian and reduced the fear ($P = 0.08$) and fear squared ($P = 0.07$) to marginal significance. There were no independent effects for any of the three emotion regulatory variables in this model. Finally, we tested whether the effects of the emotion variables were consistent across ethnic groups by creating interaction terms between the ethnic dummy codes and the emotion/emotion regulatory variables; there were no interaction effects.

Predicting PSA Screening with Trait Fear and Emotion Regulation. The model predicting frequency of PSA testing was similar to that for DRE in many respects. As can be seen in Table 5, the initial model was significant [$F(9, 298) = 7.52$, $P < 0.01$] and explained 19% of the variance in PSA screening. Less frequent PSA screening was again predicted by younger age, marginally by lower income, by poorer perceptions of PSA access, and by being Haitian or Eastern European. As with the DRE model, adding trait fear produced a significant model [$F(10, 297) = 7.19$, $P < 0.01$], enabling the prediction of an additional 1% of screening variance [$F\Delta(1, 297) = 3.63$, $P = 0.058$]. There were no noteworthy changes in the other predictors.

The third step in which the quadratic fear term was added to the model also produced a significant model [$F(11, 296) = 6.83$, $P < 0.01$], although the 1% change in variance explained was only marginally significant [$F\Delta(1, 296) = 2.83$, $P = 0.094$]. The model was essentially unchanged at this step, although adding the quadratic term (itself marginal at $P = 0.09$) enabled fear to predict greater PSA frequency ($P = 0.012$). Finally, adding the composite monitoring/blunting score and trait inhibition and expressivity in the final step produced a significant model [$F(14, 293) = 5.61$, $P < 0.01$], although it was not an improvement on the prior step [$F\Delta(3, 293) = 1.09$, n.s.]. However, adding the emotion regulatory variables reduced the fear ($P = 0.063$) and fear squared ($P = 0.086$) terms to marginal significance. As with the DRE model, there were no significant effects for any of the three emotion regulatory variables. Finally, we tested whether the effects of the emotion variables were consistent across ethnic groups by creating interaction terms between the ethnic dummy codes and the emotion/emotion regulatory variables; as in the DRE model, there were no interaction effects.

Linear and Nonlinear Effects for Fear in DRE and PSA Screening. As is evident in step 3 of the PSA and DRE models, fear had both linear and nonlinear relations with rates of screening. To examine this effect somewhat further, we plotted the mean residual values for DRE and PSA screening as a

Table 4. Raw and standardized coefficients from the regression of DRE tests on demographic variables, access, and ethnicity (step 1) together with trait fear (step 2), a nonlinear fear term (step 3), and three emotion regulatory variables (step 4)

Step	Independent variables	Step 1 (F = 6.02*)		Step 2 (F = 6.05*)		Step 3 (F = 5.92*)		Step 4 (F = 5.14*)	
		B (SE)	β	B (SE)	β	B (SE)	β	B (SE)	β
1	Age	0.04 (0.01)	0.18*	0.04 (0.01)	0.19*	0.04 (0.01)	0.19*	0.04 (0.01)	0.19*
	Income	0.00 (0.00)	0.11†	0.00 (0.00)	0.12‡	0.00 (0.00)	0.12‡	0.00 (0.00)	0.13‡
	African American	−0.54 (0.26)	−0.16‡	−0.54 (0.25)	−0.16‡	−0.57 (0.25)	−0.17‡	−0.48 (0.25)	−0.15†
	English Caribbean	−0.32 (0.24)	−0.10	−0.24 (0.24)	−0.07	−0.21 (0.24)	−0.06	−0.15 (0.24)	−0.05
	Haitian	−0.82 (0.24)	−0.25*	−0.66 (0.25)	−0.20*	−0.54 (0.25)	−0.16‡	−0.45 (0.25)	−0.14†
	Dominican	0.09 (0.25)	0.03	0.15 (0.25)	0.05	0.18 (0.25)	0.05	0.23 (0.25)	0.07
	Puerto Rican	−0.59 (0.24)	−0.18*	−0.57 (0.24)	−0.17*	−0.55 (0.24)	−0.17‡	−0.49 (0.24)	−0.15‡
	East. European	−0.80 (0.24)	−0.24*	−0.78 (0.24)	−0.24*	−0.80 (0.24)	−0.24*	−0.70 (0.24)	−0.21*
	DRE access	0.13 (0.06)	0.13‡	0.13 (0.06)	0.12‡	0.13 (0.06)	0.13‡	0.13 (0.06)	0.12‡
2	Trait fear	—	—	0.16 (0.07)	0.13*	0.25 (0.08)	0.22*	0.16 (0.09)	0.14†
3	Trait fear^2	—	—	—	—	−0.11 (0.05)	−0.13‡	−0.10 (0.05)	−0.12†
4	Monitor/blunter composite	—	—	—	—	—	—	0.06 (0.04)	0.08
	Expressivity	—	—	—	—	—	—	0.01 (0.01)	0.10
	Inhibition	—	—	—	—	—	—	0.01 (0.01)	0.06
	Constant	−0.90 (0.76)	—	−1.12 (0.76)	—	−1.06 (0.75)	—	−1.80 (0.84)	—

NOTE: Ethnicity is coded such that 1 = African American, English Caribbean, Haitian, Dominican, Puerto Rican, and Eastern European.
*$P < 0.01$.
†$P < 0.10$.
‡$P < 0.05$.

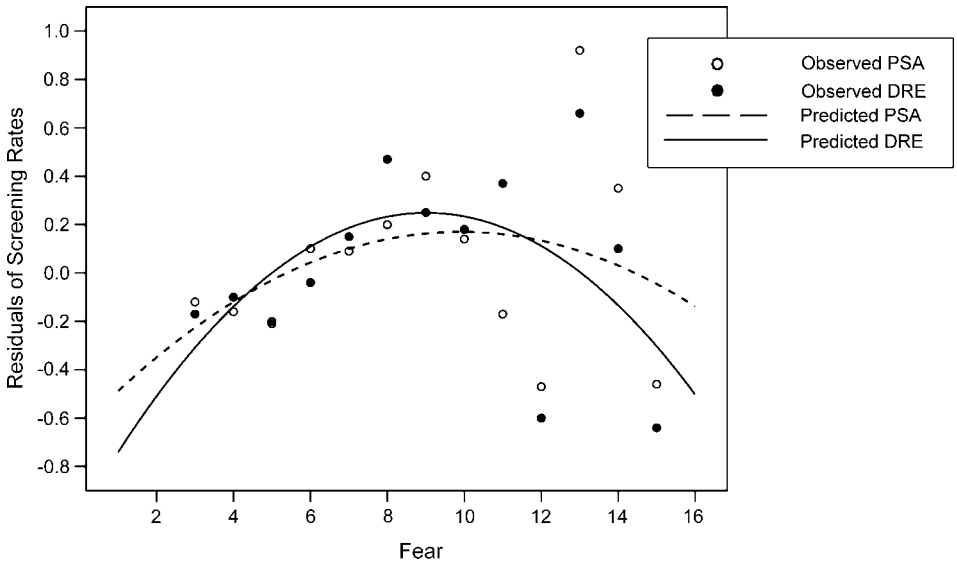

Figure 1. Estimated quadratic curves depicting the relation between fear and DRE and PSA screening frequency. Note that curves are estimated using standardized residuals from step 3 in multiple regressions and control for demographics and ethnicity.

function of the raw fear scores (after controlling for age, income, ethnicity, and perceived access). Figure 1 indicates the fit of the quadratic relation, seen in the inverted U shape. Consistent with one recent study (69), too little or too much fear was associated with poorer screening, whereas moderate fear predicts better screening rates. Higher screening rates for DRE and PSA are evident for values of fear between 6 and 10, values that approximately correspond to the middle 68% of the fear distribution.[4]

Discussion

As expected, the present report revealed significant ethnic variation in the frequency of both DRE and PSA screening among men from seven different ethnic groups; these differences remained even when demographic variables and perceptions regarding access to screening services were controlled. Our analyses also revealed a complex pattern of relations between emotion and prostate screening behaviors. Greater trait fear/anxiety showed the predicted positive relation with increased DRE and PSA screening frequency, although there were also strong indications of an underlying nonlinear relation; these relations did not substantively change when monitoring/blunting tendencies and the tendencies to express and inhibit emotion were added to the model. Although emotion regulatory and monitoring/blunting tendencies did not predict additional screening variance, trait fear seemed to have both linear and nonlinear relations with screening frequencies. Below, we discuss these findings in greater detail, focusing on ethnic differences in screening and the central, if complex, role of fear in male screening behavior.

Subpopulation Differences in Prostate Cancer Screening. As noted, there were screening rate differences among European, African, and Hispanic subpopulations of men from our seven ethnic groups. Consistent with the poor breast screening profile studies reported for women from Caribbean subpopulations (48), multiple regressions in which age, income, and access were controlled showed that men from all groups other than Dominicans and the English-speaking Caribbean reported fewer DRE tests than European Americans. Results differed somewhat in the PSA model with only Haitian, Eastern European, and, marginally, Puerto Rican men differing from the European American majority. The fact that these differences obtain even when controlling for the expected effects of age (28-30), higher socioeconomic status (25, 26), and access (31-33) is important and argues against an interpretation of ethnic screening rate differences as exclusively resulting from sociodemographic differences (23, 24).

It is clear that men from the five immigrant groups reported the poorest screening profile (see Tables 2, 4, and 5), particularly among those groups for whom their native language is infrequently available in primary care practice (Eastern Europeans and Haitians). It is also worth noting that Dominican men reported a surprisingly active screening history, a finding that meshes with some recent breast screening research (48), although not with other studies (87-91). To our knowledge, immigration status, language use, and acculturation have not yet been a focus of empirical scrutiny when considering prostate cancer screening, although research in the context of breast cancer screening suggests they are likely to be important (36, 91, 92).

Finally, it is worth noting that the complex pattern of screening rate differences uncovered here is incommensurate with the tendency for researchers to group individuals from minority groups within general racial rubrics, such as ''White,'' ''Black,'' and ''Hispanic.'' Although men from most minority subpopulations differed from the majority in the regressions, additional univariate analyses showed further differences *among* the minority subpopulations; Haitian men reported some of the lowest levels of DRE and PSA tests. Consistent with prior research (American Cancer Society, 2003), U.S.-born African Americans differed from U.S.-born European Americans for DRE but not PSA frequency. Although our data reflect comparatively small and non–randomly selected groups of men (a clear limitation), the fact that prostate cancer screening rate differences are evident and remain evident even when demographic factors are controlled

[4] As indicated in the description of the variables, the PSA and DRE measures were positively skewed and were transformed with a standard square root transformation to improve the fit and to more closely approximate a normal distribution. In so doing, however, the interpretation of the predicted quadratic effect of fear becomes less simple, because all contributing factors must be accounted for in the interpretation of the original PSA and DRE scores. The coefficients b and c in the simple form of the quadratic equation, $y = a + bx + cx^2$, contribute to the coefficients of the original equation [$z = y^2 - 1$, where z is the original raw score, transformed by $(z + 1)^{-0.5} = y$] and are needed to explain the relation between fear (the only variable for which nonlinearity is suggested) and the nontransformed screening variables. The contributions of b and c to the x^3 and x^4 terms are negligible and without theoretical basis. To facilitate the full interpretation of the linear and nonlinear effects of fear (depicted in Fig. 1), both b and c must be determined from the square root equation, hence, the fitted quadratic, rather than linear, equation from the transformed variables in Fig. 1.

must be taken as indicative of the dangers inherent in ignoring variation *within* major ethnic groupings and the need for their continued study (35, 39).

Emotion, Emotion Regulation, Information Processing, and Prostate Cancer Screening. The emotion and emotion regulatory variables examined here contributed to the prediction of both PSA and DRE frequency in our multiethnic sample of men (44, 49). When added to the model predicting DRE testing, trait fear significantly improved the initial model and contributed an additional 2% of variance with an effect size on par with classic predictors, such as age and income. Similarly, although marginal, greater fear was associated with greater screening in the PSA model, contributing an additional 1% of explained variance. Importantly, fear retained an association with greater screening and evinced a likely underlying inverted U function even when characteristic styles of regulating emotion (inhibition and expression) and styles of information processing were controlled. This represents a particularly rigorous test of fear's relation to screening and underscores how central fear is to male as well as female screening behavior.

Within psychosocial models of health behavior, the relation between fear and screening is not unexpected. When a person is anxious, their cognitive processes and motivational priorities shift. They begin to evaluate the environment for the source of the threat and engage in information-seeking and support-seeking behaviors, as well as in behaviors that consciously or unconsciously serve to ameliorate the unpleasant experience of anxiety (51). In this view, a man with relatively high trait anxiety will be more attentive to information relating to health threats, will likely be more sensitive to physical symptoms, may thus go to the doctor more regularly, and may thus screen more frequently (93). The current study did not examine the effect of sources of care and future studies should carefully control the relevant variables to test these explanatory possibilities.

However, although the finding is consistent with models of anxiety and fear suggesting that trait anxiety and ''cancer worry'' constructs will be *positively* related to screening outcome (51), this finding needs to be reconciled with data from other studies. More anxious men have been shown to be more likely to drop out of a screening program (94), and another study has found that worry about screening may predict self-care (versus formal care) efforts (44). In reconciling these data, there are a few comments that bear noting. First, fear of screening (44) is not the same phenomenon as dispositional fear; it is expected that the two will relate differentially to screening because avoidance of the screening setting will reduce fear of screening but is less likely to favorably reduce general anxiety or cancer worry (51). However, like the current work, the Roumier et al. study (94) also assessed dispositional anxiety, although it involved men who were already enrolled in a screening program. Screening is known to cause anxiety (94), and it seems that higher levels of anxiety interfere with screening.

Indeed, our inclusion of a quadratic fear term showed that fear was related to screening frequency in both linear and nonlinear ways. Specifically, the addition of a quadratic fear term improved model fit (see Tables 4 and 5), and further analyses revealed the inverted U shape found in one recent study of mammography (69). As in the Andersen et al. work (69), too little or too much fear was associated with poorer screening, whereas moderate levels of fear predicted the highest rates of screening. It has been suggested that this effect may result from fear motivating health behavior at moderate levels but potentially promoting avoidance or denial at high levels (69); denial has been linked to delays in responding to breast symptoms (61, 66, 67). However, the fact that the quadratic trends remained evident in both DRE and PSA screening frequency even when controlling for tendencies in monitoring/blunting, inhibition, and expressiveness suggests more work is needed to understand this effect.

Underscoring the central importance of fear to male screening were two findings. First, adding emotion regulatory variables to the model failed to (*a*) significantly improve DRE or PSA model fit or (*b*) exert significant independent effects. Second, fear did not interact with ethnicity, suggesting that the effects of fear generalize across groups. In contrast to prediction, emotional expressivity did not predict greater screening in either model, and there were no effects for either the composite monitoring/blunting variable or trait inhibitory tendencies on screening behavior. Although the models clearly began to suffer from some power issues and the shared variance between emotion and emotion regulation, trait fear retained marginal linear and quadratic terms even with

Table 5. Raw and standardized coefficients from the regression of PSA tests on demographic variables, access, and ethnicity (step 1) together with trait fear (step 2), a non-linear fear term (step 3) and three emotion regulatory variables (step 4)

Independent variables		Step 1 (F = 7.52)*		Step 2 (F = 7.19)*		Step 3 (F = 6.83)*		Step 4 (F= 5.61)*	
		B (SE B)	β	B (SE B)	β	B (SE B)	β	B (SE B)	β
Step									
1	Age	0.04 (0.01)	0.20*	0.04 (0.01)	0.21*	0.04 (0.01)	0.21*	0.04 (0.01)	0.22*
	Income	0.00 (0.00)	0.11†	0.00 (0.00)	0.12‡	0.00 (0.00)	0.12‡	0.00 (0.00)	0.12‡
	African American	−0.12 (0.25)	−0.04	−0.11 (0.25)	−0.03	−0.14 (0.25)	−0.04	−0.10 (0.25)	−0.03
	English Caribbean	−0.14 (0.24)	−0.04	−0.08 (0.24)	−0.03	−0.06 (0.24)	−0.02	−0.05 (0.24)	−0.02
	Haitian	−0.57 (0.24)	−0.17‡	−0.44 (0.24)	−0.13†	−0.35 (0.25)	−0.10	−0.30 (0.25)	−0.09
	Dominican	0.22 (0.24)	0.07	0.26 (0.24)	0.08	0.28 (0.24)	0.09	0.31 (0.24)	0.09
	Puerto Rican	−0.32 (0.24)	−0.10	−0.31 (0.24)	−0.09	−0.29 (0.24)	−0.09	−0.27 (0.24)	−0.08
	Eastern European	−0.58 (0.24)	−0.18‡	−0.57 (0.24)	−0.17‡	−0.58 (0.24)	−0.17‡	−0.53 (0.24)	−0.16‡
	PSA Access	0.30 (0.06)	0.26*	0.29 (0.06)	0.26*	0.29 (0.06)	0.26*	0.29 (0.06)	0.26*
2	Trait fear	— (—)	—	0.12 (0.07)	0.11†	0.20 (0.08)	0.18‡	0.17 (0.09)	0.15†
3	Trait fear^2	— (—)	—	— (—)	—	−0.09 (0.05)	−0.11†	−0.09 (0.05)	−0.11†
4	Monitor/Blunter Composite	— (—)	—	— (—)	—	— (—)	—	−0.01 (0.04)	−0.01
	Expressivity	— (—)	—	— (—)	—	— (—)	—	0.02 (0.01)	0.11†
	Inhibition	— (—)	—	— (—)	—	— (—)	—	−0.01 (0.01)	−0.04
	Constant	−1.84 (0.75)	—	−2.00 (0.76)	—	−1.95 (0.75)	—	−2.34 (0.84)	—

NOTE: Ethnicity is coded such that 1 = African American, English-Caribbean, Haitian, Dominican, Puerto Rican, and Eastern European.
*$P < 0.01$.
†$P < 0.10$.
‡$P < 0.05$.

emotion regulatory variables controlled. Prima facie, this pattern of results suggests that emotion regulatory and information processing variables are less important to male screening behavior than the underlying emotions themselves, although it should be recalled that there were some links among the zero-order relations. In addition, there are some methodologic limitations that must be considered when examining the failure of the monitoring/blunting variable to predict screening.

In theory, individuals with higher monitoring/blunting scores are more prone to scan the environment for threatening cues, cognitively amplify health threats, and perceive themselves to be more vulnerable (77, 81, 95). Thus, although monitoring is not an emotional variable per se, this characterization bears striking similarities to the cognitive style of individuals with greater dispositional anxiety. Indeed, individuals with greater monitoring tendencies tend to report greater distress (95) and have been shown to have greater intention to undergo preventive surgeries (96), perhaps because of heightened anxiety (95). However, monitoring/blunting scores did not predict self-reported PSA or DRE frequency in the current study, although they were related to DRE frequency in zero-order relations. This may reflect the notion that the effects of high monitoring are only evident when stress/threat is high (97), a consideration not tested here, or may reflect the fact that dispositional anxiety is better suited to capturing this domain of screening variance for men. Alternately, however, it must be acknowledged that our use of the abridged monitoring-blunting scale may have created an index that differs somewhat from the full scale.

Limitations and Implications for Prostate Cancer Screening Research. Although the current data contain much promise, a number of factors must constrain our confidence in our interpretations and several issues remain unclear. First, although our sample comprised men from seven well-defined ethnic groups, the samples were collected on a convenience basis, and these findings need to be replicated in more rigorously sampled populations.[5] Second, the effect sizes for the psychological variables are small, although their magnitude was on par with those of known predictors of screening, including age and income. Perhaps more importantly, whereas age and income are immutable for intervention purposes and are better suited to *identifying* ''at-risk'' populations, psychological characteristics may be particularly amenable to change (47); modest effects may be of considerable practical significance (37). It seems likely, for example, that a modicum of dispositional anxiety is useful in promoting more active screening profiles, although how such anxiety might best be activated remains unclear at this point.

Although promising, the current data also underscore the need for further work before the role of fear in male screening behavior can be understood. First, although our data indicate an equivalent *effect* of trait fear across underrepresented groups, mean level differences in psychological characteristics related to screening nonetheless imply that intervention plans should examine the attributes of diverse minority groups (who are typically at risk for poor screening profiles) to consider how their characteristics may be relevant to their screening behavior. Second, the current data imply that individuals or groups with suboptimally low or high anxiety are likely to screen less frequently. Clinically, this may imply that educators must be mindful of baseline anxiety levels before they engage in educational or information-providing interventions that may reduce anxiety to nonoptimal levels. Less clear is how psychological characteristics like trait fear interact with other variables, such as knowledge, attitudes, and beliefs, and how the generally facilitative effect of trait fear on screening interacts with fears that are more specific to the screening process. Screening researchers critically need to examine how engaging in a target health behavior effects felt anxiety; in our opinion, it is when target health behaviors *reduce* anxiety that anxiety is most useful (51, 64).

[5] Although the absence of demographic work at the level of ethnic specificity employed in the current study means that direct estimates of representativeness are difficult to ascertain, the available census data together with prior studies conducted in our laboratory among these populations indicate that the demographic characteristics of the current sample are a reasonable reflection of the population in Brooklyn and New York City. Overall, the average household income of our sample was somewhat higher than the 1999 Census reported incomes in New York City for European American males (US$60.4K in our sample versus US$37K in the non-Hispanic Caucasian census sample), Dominican males (US$29K versus US$17K), and Puerto Rican males (US$25.8K versus US$19K). The mean income among Black males in New York City is reported by the census to be about US$22K; however, our sample was divided into African Americans (who earned US$20.7K, only slightly less) and English-speaking Caribbeans (who earned US$33.3K, significantly more). Therefore, it seems that averaged across African American and English-speaking Caribbean males, our Black population's mean income was quite similar to that represented by the census. No census data were available for Eastern European or Haitian men in New York City. In terms of education, the average non-Hispanic Black male in New York City, ages 45 to 64 years, has completed ~12.2 years of school; our African American sample completed an average of 12.9 years (SD = 2.4), and our English speaking Caribbean sample completed an average of 12.6 years (SD = 3.8). According to the census, non-Hispanic White males in this age bracket in New York City completed an average of 13.8 years of school. In our sample, Eastern European Whites completed 14.4 years (SD = 3.2), and European American Whites completed 16.1 (SD= 3.9), with an average across these two groups of 15.25 years. The census reports that Puerto Rican men in New York City, ages 45 to 64 years, completed an average of 9.62 years of school; our Puerto Rican sample completed 10 years (SD = 6.2). Finally, the census reports that Dominican men in New York City in this age group completed an average of 8.9 years of school; our Dominican sample completed 9.5 years (SD = 3.9). There is no available census data regarding the level of education among Haitian men, or among the subgroups of Black and White men presented in the current study. Strengthening our confidence in the generalizability of the effects pertaining to these samples is the fact that their overall demographic profiles are similar to those of groups of these individuals in prior *population-based* studies we have conducted (37, 48). Both these prior studies used a stratified cluster sampling plan, with data on the census blocks gathered from the Household Income and Race Summary Tape File 3A of the 1990 Census files and provide indirect evidence of the representativeness of the current sample.

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