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Understanding Cancer Worry among Patients in a Community Clinic-based Colorectal Cancer Screening Intervention Study

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Abstract

Background—To reduce colorectal cancer (CRC) screening disparities, it is important to understand correlates of different types of cancer worry among ethnically-diverse individuals.

Objectives—The current study examined the prevalence of three types of cancer worry (i.e., general cancer worry, CRC-specific worry, and worry about CRC test results) as well as sociodemographic and health-related predictors for each type of cancer worry.

Methods—Participants ($N = 416$) were aged 50–75, at average CRC risk, non-adherent to CRC screening guidelines, and enrolled in a randomized controlled trial to increase CRC screening.

Participants completed a baseline questionnaire assessing sociodemographics, health beliefs, healthcare experiences, and three cancer worry measures. Associations between study variables were examined with separate univariate and multivariable logistic regression models.

Results—Forty-seven percent of participants reported experiencing moderate-to-high levels of general cancer worry. Predictors of general cancer worry included salience and coherence (OR = 1.14, 95% CI: 1.01-1.28), perceived susceptibility (OR = 1.18, 95% CI: 1.09-1.27), and social influence (OR = 1.07, 95% CI: 1.01-1.13). Twenty-three percent reported moderate-to-high levels of CRC-specific worry which was predicted by perceived susceptibility (OR = 1.40, 95% CI: 1.26-1.56) and social influence (OR = 1.10, 95% CI: 1.02-1.19). Thirty-five percent reported moderate-to-high levels of worry about CRC test results which was predicted by perceived susceptibility (OR = 1.23, 95% CI: 1.13-1.33) and marital status (OR = 2.00, 95% CI: 1.07-3.73 for married/partnered vs. single and OR = 2.26, 95% CI: 1.26-4.05 for divorced/widowed vs. single).

Discussion—Perceived susceptibility consistently predicted the three types of cancer worry, whereas other predictors varied between cancer worry types and in magnitude of association. The three types of cancer worry were generally predicted by health beliefs, suggesting potential malleability. Future research should include multiple measures of cancer worry and clear definitions of how cancer worry is measured.

Keywords

cancer worry; colorectal cancer screening; cancer prevention; emotions

Unlike most other cancers, colorectal cancer (CRC) mortality can be prevented through the detection of tumors at an early stage when treatment is more successful and also through the discovery and removal of precancerous colon polyps during screening (American Cancer Society [ACS], 2014). Guidelines from the American Cancer Society, the US Multi-Society Task Force on Colorectal Cancer, and the American College of Radiology recommend the following CRC screening tests for average risk men and women age 50 and older: colonoscopy every 10 years, flexible sigmoidoscopy every 5 years, double-contrast barium enema every 5 years, computed tomographic colonography every 5 years, stool DNA test, annual fecal occult blood test [FOBT], or annual fecal immunochemical test [FIT]) (Levin et al., 2008). However, only 59.1% of age-appropriate adults are currently up-to-date (ACS, 2014). Screening rates are even lower in medically-underserved populations (e.g., recent immigrants, uninsured individuals, and racial/ethnic minority groups) contributing in part to health disparities in incidence and mortality (ACS, 2014).

The role that emotions (e.g., worry, embarrassment) may play in cancer screening has been examined in multiple studies in recent years (Bynum, Davis, Green, & Katz, 2012; Consedine, Ladwig, Reddig, & Broadbent, 2011; Hay, Buckley, & Ostroff, 2005; Vrinten, Waller, von Wagner, & Wardle, 2015). The construct of cancer worry may include multiple cancer-related emotions including worry, fear, concern, distress, and anxiety (Consedine, Magai, Krivoshekova, Ryzewicz, & Neugut, 2004; Hay et al., 2005). Many prior studies have conceptualized cancer worry as worry about developing a specific kind of cancer (e.g., CRC-specific worry, or an emotional response to the threat of developing CRC specifically)

(Hay et al., 2005; Moser, McCaul, Peters, Nelson, & Marcus, 2007; Wardle et al., 2000; Watts, Vernon, Myers, & Tilley, 2003). Other studies have measured worry regarding screening procedures associated with specific cancer types as well as concern about what the screening test results might reveal (e.g., CRC test worry, or worry about undergoing a specific CRC screening test such as colonoscopy or stool blood test, or worry about receipt of abnormal test results) (Consedine et al., 2004; Hay et al., 2005; McKinney & Palmer, 2014). Worry about cancer can also be measured as general cancer worry (i.e., an emotional response to the threat of developing any type of cancer or cancer in general over the course of one's lifetime) (Consedine et al., 2004; Vrinten, van Jaarsveld, Waller, von Wagner, & Wardle, 2014). Each of these constructs may be informative when considering cancer screening behaviors because: 1) relationships between screening behavior and cancer worry vary by the construct measured and 2) of racial/ethnic differences in emotional expression and response (Consedine et al., 2004; Hay et al., 2005). Prior studies have focused either on worry about CRC itself or about CRC screening tests (Efuni et al., 2015; Friedman et al., 1999; Jandorf et al., 2010; Manne et al., 2015; McQueen, Vernon, et al., 2008), and have found that CRC worry is low in the general population (Hay et al., 2005; Wardle et al., 2000; Watts et al., 2003).

As Hay and colleagues and other researchers have noted, there have been multiple hypotheses to explain how cancer worry may impact various types of cancer screening behavior such as: (1) cancer worry can inhibit screening behavior; (2) cancer worry can facilitate cancer screening behavior; (3) there is a curvilinear relationship between cancer worry and screening behavior such that moderate levels of cancer worry can optimize screening behavior; and (4) other factors (e.g., self-efficacy) are necessary in order for cancer worry to facilitate cancer screening (Consedine et al., 2004; Hay et al., 2005; Hay, McCaul, & Magnan, 2006). In CRC screening literature, there is empirical support for these diverse hypotheses. For example, some studies conclude that cancer worry is a facilitator of CRC screening uptake (Messina, Lane, & Anderson, 2012; Moser et al., 2007; Wang et al., 2006; Wong et al., 2013), while others concluded it was a barrier (Philip, DuHamel, & Jandorf, 2010; Robinson et al., 2011). Other studies found no correlation between cancer worry and CRC screening (Friedman, Webb, Richards, & Plon, 1999; Llanos et al., 2014; Manne, Steinberg, Delnevo, Ulpe, & Sorice, 2015).

Unfortunately, there are significant gaps in our knowledge of cancer worry among certain populations. First, many prior CRC worry studies have focused upon individuals at increased CRC risk (i.e., those with a strong family history of CRC, ulcerative colitis, polyposis, or other gastrointestinal syndromes) rather than individuals at average risk (i.e., those without known risk factors) (McBride et al., 2008; Murphy, Lewis, Golin, & Sandler, 2015; Stark, Bertone-Johnson, Costanza, & Stoddard, 2006; Wagner et al., 2005). However, the majority of CRC (~80%) occurs in individuals at average risk (ACS, 2014). Second, although there has been some evidence that worry may be positively associated with perceived susceptibility (Dillard, Ferrer, Ubel, & Fagerlin, 2012; Hay, Coups, & Ford, 2006; McQueen, Vernon, Meissner, & Rakowski, 2008; Stark et al., 2006; Vernon, Myers, Tilley, & Li, 2001; Zajac, Klein, & McCaul, 2006), studies of the relationship between cancer worry and other theory-based health beliefs (e.g., self-efficacy, salience and coherence) among individuals at average CRC risk are lacking. Third, participants in prior studies have

largely been from a single racial/ethnic group, not classified as medically-underserved, and/or living in a single setting (e.g., either urban or rural) (Efuni, DuHamel, Winkel, Starr, & Jandorf, 2015; Friedman et al., 1999; Jandorf et al., 2010; Llanos et al., 2014; Manne et al., 2015; McQueen, Vernon, et al., 2008; Wang et al., 2006). Given health disparities in CRC diagnoses and underutilization of CRC screening among the medically-underserved (ACS, 2014), it is vital that we understand cancer worry among ethnically-diverse individuals who are at average risk for CRC.

One potential barrier to our understanding of cancer worry in various populations is the lack of consistency in how cancer worry is measured (Hay et al., 2005). Inconsistency in measurement of this construct in both item content and response options (e.g., frequency, magnitude) makes it difficult to compare studies and understand how cancer worry is experienced in different populations (Hay et al., 2005). Furthermore, most studies that include a measure of cancer worry do not fully examine this construct, instead using only one measure of cancer worry. However, this may preclude a complete picture of the role of different kinds of worry in cancer screening behaviors. Understanding the associations between emotion-focused and cognitive-based health-related constructs may substantially help in the development of more relevant CRC screening interventions and messages for improving CRC screening behavior, especially among ethnically-diverse, medically-underserved groups (Moser et al., 2007). Thus, in the current study, we aimed to more fully understand cancer worry experienced by medically-underserved individuals by measuring multiple types of cancer worry.

The purpose of this study was to identify the prevalence and correlates of three types of cancer worry (i.e., general cancer worry, CRC-specific worry, and worry about CRC test results) in a racial-ethnically diverse sample of medically underserved patients aged 50-75 years who were receiving care in community clinics. Six constructs of the Preventive Health Model (PHM) most relevant to CRC screening behavior (i.e., salience and coherence, perceived susceptibility, response efficacy, social influence, self-efficacy, and religious beliefs) were considered to better understand relationships between these health-related beliefs and cancer worry (McQueen, Tiro, & Vernon, 2008; Myers et al., 1994; Myers et al., 2007; Tiro, Vernon, Hyslop, & Myers, 2005; Vernon, Myers, & Tilley, 1997). In addition, associations between cancer worry and sociodemographic variables, healthcare experience variables, and additional constructs (e.g., perceived discrimination, cancer fatalism, health literacy, awareness, decisional conflict, and trust in the healthcare system) were examined. We conducted analyses to address the following research questions:

1. What is the prevalence of general cancer worry, CRC-specific worry, and worry about CRC test results?
2. Which sociodemographic, health-related beliefs and healthcare experience variables were significant independent predictors of general cancer worry, CRC-specific worry, and worry about CRC test results?

We hypothesized differential associations between sociodemographic (e.g., age, gender, marital status), health-related beliefs (e.g., salience and coherence, perceived susceptibility, social influence), and healthcare experiences (e.g., prior cancer screening) across the three

types of cancer worry. Given the dearth of literature on these relationships across the three types of cancer worry, our hypothesis is exploratory and it is expected that findings would inform decisions about which type(s) of cancer worry should be measured.

Methods

The current study utilized baseline data (pre-intervention) from a CRC screening randomized controlled trial (RCT) intervention study (Davis et al., 2016). The study builds upon the established efforts of the Tampa Bay Community Cancer Network (TBCCN), a partnership between 28 local community organizations and a National Cancer Institute-designated cancer center that was formed to address health disparities in the Tampa Bay area. Intervention details for the larger RCT study are described elsewhere (Davis et al., 2016). Briefly, the study was conducted in two federally qualified health centers [FQHCs] and a county health department clinic which serve a large number of racially diverse people aged 50 years or older. Potential participants were assessed for eligibility and enrolled in the study while waiting for their primary care visit. Individuals were eligible for the study if they: (1) were aged 50-75 years; (2) were able to speak, read, and write English; (3) had no personal CRC diagnosis or presumptive symptoms of CRC, and were not at high risk; (4) self-reported as not current to CRC screening guidelines (i.e., had never been screened or previously screened but were not up-to-date per national recommendations); and (5) provided at least two forms of contact information (i.e., mailing address, home telephone, cell phone, or email address) and the contact information of a relative not living with the participant to facilitate follow-up contacts.

The University of South Florida and Florida Department of Health Institutional Review Boards approved study procedures. Potential participants were approached by the study coordinator in the waiting area of the clinic. If they agreed to participate, the study coordinator introduced the study and confirmed eligibility. For those eligible, the study coordinator explained the study details, answered their questions, and obtained written informed consent. Participants providing informed consent were asked to complete the baseline questionnaire via face-to-face interview. Participants received a \$10 gift card following completion of the baseline questionnaire. The RCT for the parent study is registered at ClinicalTrials.gov (NCT01804179). Data were collected between August 2012 and July 2014.

Measures

Descriptions of the measures utilized are described below.

Cancer worry variables—General cancer worry was measured by one item: “How often do you worry about getting cancer? Would you say...” (Christy et al., 2016; National Cancer Institute [NCI], 2009). CRC-specific worry was measured by one item: “How often do you worry about getting colon cancer? Would you say...” (Christy et al., 2016; NCI, 2009). Response options for each item were rarely or never = 0, sometimes = 1, often = 2, and all the time = 3. Worry about CRC test results was measured with two items to determine participants’ concerns about negative consequences of completing a CRC screening test: “I am afraid of having an abnormal colorectal cancer screening test result” and “I am worried

that colon cancer screening will show that I have colon cancer or polyps” (Vernon et al., 1997). Responses were assessed using a 5-point Likert scale ranging from strongly disagree = 1 to strongly agree = 5 (McQueen, Tiro, et al., 2008; Tiro et al., 2005; Vernon et al., 1997). Responses to the two items were summed. Reliability and validity for this scale have been previously demonstrated (Tiro et al., 2005; Vernon et al., 2001). Cronbach’s alpha for the current study was .78.

Predictor variables

PHM—The PHM constructs were assessed using a 5-point Likert scale ranging from strongly disagree = 1 to strongly agree = 5 (Vernon et al., 2001). These measures have been shown to be reliable and valid (Tiro et al., 2005; Vernon et al., 2001). Items used in each construct had been previously applied in studies with diverse populations (Christy et al., 2016; Gwede et al., 2010; McQueen, Tiro, et al., 2008; Tiro et al., 2005). The following PHM constructs were examined: salience and coherence, perceived susceptibility, response efficacy, social influence, self-efficacy, and religious beliefs. For *salience and coherence*, three items asked whether CRC screening made sense, was important, and would help protect their health. The fourth item asked whether the participant would be healthy if he/she avoided CRC screening and was reverse coded for scoring. Cronbach’s alpha for the current study was .68. *Perceived susceptibility* was measured by three items that asked whether the participant’s chances of developing CRC or polyps was high, whether he/she was very likely to develop CRC or polyps, and whether he/she was at lower risk for CRC compared with other persons of his/her age (McQueen, Tiro, et al., 2008; Tiro et al., 2005; Vernon et al., 2001). In the current study, Cronbach’s alpha was .83. *Response efficacy* was measured by two items asking whether removal of CRC polyps can prevent CRC and whether CRC found early can be cured (McQueen, Tiro, et al., 2008; Tiro et al., 2005; Vernon et al., 2001). Cronbach’s alpha was .63. *Social influence* was measured by four items related to what the family/doctor/health professional thought about the participant having a CRC screening test and whether the participant desired to comply with the important others’ attitudes toward CRC screening (McQueen, Tiro, et al., 2008; Tiro et al., 2005; Vernon et al., 2001). In the current study, Cronbach’s alpha was .67. *Self-efficacy* was measured by six items related to the participant’s confidence in their ability to collect a stool sample (McQueen, Tiro, et al., 2008; Tiro et al., 2005; Vernon et al., 2001). Cronbach’s alpha in the present study was .80. *Religious beliefs* was measured by five items asking how religious beliefs influence health behaviors. Cronbach’s alpha in the current study was .67.

Health literacy—Health literacy was measured using the 11-item version of the Rapid Estimate of Adult Literacy–Revised which provides a gauge of health literacy (Bass, Wilson, & Griffith, 2003; Davis et al., 1993). One point is given for each item correctly pronounced (only 8 items are scored). Individuals with a score of 6 or less are considered at risk for poor health literacy. Prior research has demonstrated good psychometric properties and scores highly correlated with full length measure scores (Bass et al., 2003; Davis et al., 1993).

Awareness—Awareness was assessed with questions adapted from the Health Information National Trends Survey (NCI, 2009). Participants were asked whether they previously heard of the FOBT, sigmoidoscopy, and colonoscopy. One point was assigned for each “yes”

response. Nine additional items assessed CRC-related knowledge with one point given for each correct response. A total awareness score was calculated by summing the points earned for the 12 items. Higher scores indicated greater awareness. Cronbach's alpha in the current study was .60.

Decisional conflict—The difficulty one had in making decisions about CRC screening was assessed using a 9-item scale adapted from O'Connor (O'Connor, 1995). An example includes "I feel I know the disadvantages of each option." Responses ranged from strongly agree = 1 to strongly disagree = 5 on a 5-point Likert scale. Lower scores indicated less conflict in making a decision about CRC screening. Adequate validity and reliability have been established for the scale (O'Connor, 1995). Cronbach's alpha in the present study was .91.

Perceived discrimination—Perceived discrimination was measured using an 8-item scale that focused on experiences of mistreatment in healthcare experiences as well as daily life (Williams, Yan, Jackson, & Anderson, 1997). Participants rated the frequency of each experience with the following options: often = 4, sometimes = 3, rarely = 2, and never = 1. A higher score indicates greater perception of discrimination. Previous studies suggest high internal consistency (Kessler, Mickelson, & Williams, 1999; Williams et al., 1997). In the current study, Cronbach's alpha was .84.

Trust in healthcare system—Trust in healthcare system was measured using The Health Care System Distrust Scale which assesses opinions of the health care system as a whole, hospitals, health insurance companies, and medical research (Rose, Peters, Shea, & Armstrong, 2004). Response options ranged from strongly disagree = 5 to strongly agree = 1. Three items were reverse-coded. Items were averaged to create a scale score with higher scores indicating greater distrust. Construct validity has been demonstrated (Rose et al., 2004). Cronbach's alpha in the present study was .80.

Cancer fatalism—The extent to which a person believes that death is inevitable when cancer is present was measured using the 15-item Powe Fatalism Inventory (PFI) (Powe & Finnie, 2003). Participants respond yes or no to items; one point is added for each "yes" response with higher scores indicating higher levels of fatalism. The PFI has primarily been used among older African Americans but has also demonstrated high reliability in diverse populations (Powe & Finnie, 2003). Cronbach's alpha in the current study was .83.

Sociodemographics—Sociodemographic factors included age, gender, race/ethnicity, marital status, education, insurance status, income, prior CRC screening test completion, and whether the individual had a regular personal physician.

Statistical Analysis

Descriptive statistics were generated for all sociodemographic, health-related, and cancer worry variables. Covariation among the cancer worry variables were examined using Pearson correlations. Prior to analyses of predictors, cancer worry variables were dichotomized because (1) of the over-arching goal to capture differences between moderate-

to-high and low to very low levels of worry, and (2) to provide an opportunity to present odds ratios with 95% confidence intervals across all three worry constructs. General cancer worry and CRC worry were split at “never or rarely” versus all other responses (“sometimes,” “often,” “all of the time”). The 2-item worry about CRC test results measure was split at 7 (range 2-10), a cutpoint dividing strongly disagree, disagree, and neutral from agree and strongly agree.

Sociodemographic and health-related variables were examined individually as a predictor of each type of cancer worry using logistic regression models. The unadjusted odds ratio and 95% confidence interval was calculated. Variables with a *p*-value less than 0.05 in a univariate model were included in the final multivariable model for each type of cancer worry.

Results

Sample Characteristics

Table 1 presents descriptive statistics for sociodemographic and health-related variables for the 416 participants who completed the baseline interview. Participants' mean age was 55.7 years. The majority were female (54%), had a household income of less than \$10,000 (63%), and had health insurance (62%). Fifty-nine percent of participants were both White and non-Hispanic. The majority of participants were White (66%) or African-American (28%) and were not Hispanic/Latino (90%). Thirty-one percent were married or living with a partner and 24% reported an education of less than a high school diploma. In terms of healthcare experiences, 65% reported having a regular physician and 31% reported prior CRC screening.

Levels of Cancer Worry

For both general cancer worry and CRC worry, the majority of participants reported “never or rarely” experiencing worry: 53% and 76%, respectively. Moderate-to-high levels of worry for these measures (“sometimes,” “often,” and “all of the time”) were reported at gradually lower percentages: 30%, 11%, 6% (for general cancer worry) and 18%, 3%, 2% (for CRC worry). Scores on the 2-item worry about CRC test results ranged from 2 (36%) to 10 (12%) with an average of 5.2 (*SD* = 2.9) which is comparable to a “neither agree or disagree” response to each item (Davis et al., 2016). Thirty-five percent of participants reported moderate-to-high levels of worry about CRC test completion (i.e., as indicated by a score of 7 or higher). General cancer worry was correlated with both CRC worry (0.44, *p* < .0001) and worry about CRC test results (0.28, *p* < .0001). Similarly, CRC worry was correlated with worry about CRC test results (0.25, *p* < .0001). The low to moderate level of correlation between these measures suggests that they are measuring different constructs.

Predictors of Cancer Worry

Table 1 presents results of univariate logistic regression models. Table 2 presents results of multivariable models evaluating all significant univariate predictors. Although none of the sociodemographic or health experience variables predicted general cancer worry, three PHM variables were significant predictors: perceived susceptibility, salience and coherence, and

social influence. All three variables were significant in the multivariable model with the following adjusted odds ratios and *p*-values: salience and coherence with AOR = 1.14, 95% CI [1.01, 1.28], *p* = .04; perceived susceptibility with AOR = 1.18, 95% CI [1.09, 1.27], *p* < .001; and social influence with AOR = 1.07, 95% CI [1.01, 1.13], *p* = .02 (see Table 2).

As with general cancer worry, none of the sociodemographic or health experience variables were significant predictors of CRC-specific worry. The following health-belief variables significantly predicted CRC worry: salience and coherence, perceived susceptibility, response efficacy, social influence, religious beliefs, and perceived discrimination. The adjusted odds ratios and *p*-values for the variables that remained significant predictors in a multivariable model were as follows: perceived susceptibility with AOR = 1.40, 95% CI [1.26, 1.56], *p* < .001; and social influence with AOR = 1.10, 95% CI [1.02, 1.19], *p* = .01 (see Table 2). Salience and coherence was marginally significant with AOR = 1.18, 95% CI [1.00, 1.40], *p* = .054.

Seven variables were significant predictors of worry about CRC test results: marital status, regular physician, perceived susceptibility, social influence, religious beliefs, cancer fatalism, and perceived discrimination. In the multivariable model with these seven variables, the two variables that remained significant predictors in a multivariable model were perceived susceptibility with AOR = 1.23, 95% CI [1.13, 1.33], *p* < .001 and marital status with AOR = 2.00, 95% CI [1.07, 3.73] for married/partnered versus single and AOR = 2.26, 95% CI [1.26, 4.05] for divorced/widowed versus single (*p*-values < .02) (see Table 2).

Discussion

The aim of the study was to examine different types of cancer worry and associations between cancer worry and demographic and health-related variables in a diverse population. Consistent with our hypotheses, predictors of the three cancer worry types varied across the constructs, with the exception of perceived susceptibility which was a significant predictor of each worry type. The association between perceived susceptibility and cancer worry is consistent with prior literature (Dillard et al., 2012; Hay et al., 2006; McQueen, Vernon, et al., 2008; Stark et al., 2006; Vernon et al., 2001; Zajac et al., 2006). The belief that one is at higher risk for developing cancer predicted moderate-to-high levels of general cancer worry, CRC-specific cancer worry, and worry about positive CRC test results; thus, as might be expected, higher perceived risk predicted higher levels of all three types of cancer worry.

Prevalence and Predictors of General Cancer Worry

Almost half (47%) of participants reported experiencing moderate-to-high levels of worry about developing any cancer type in their lifetime. Salience and coherence, perceived susceptibility, and social influence were independent predictors of general cancer worry in multivariable analyses. Contrary to prior research which found that women were more likely to worry “a lot” about cancer (Vrinten et al., 2014), there were no significant gender differences in general cancer worry in the current study. Similarly, there were no significant differences in general cancer worry based upon racial/ethnic identity, marital status, or educational attainment which is contrary to findings of a prior study (Vrinten et al., 2014). However, the prior study focused upon individuals reporting “a lot” of cancer worry, which

composed 25% of the sample as opposed to our sample in which 17% who reported worrying “often” or “all the time” (Vrinten et al., 2014). Also, the prior study was conducted in the United Kingdom (UK), whereas the current study was conducted in the US. Differences in measurement as well as geographic location may account for incongruence in current study findings compared to those of prior studies.

Prevalence and Predictors of CRC Cancer Worry

In the current study, 23% of individuals reported moderate-to-high levels of worry about developing CRC, whereas 76% reported that they never or rarely worried about CRC. This is similar to prior studies in which 70-74% of participants reported rarely or never worrying about CRC (Hawley et al., 2012; Moser et al., 2007). A lower percentage of our sample (i.e., 23%) reported at least some CRC-specific worry compared to a sample from the UK in which 50% reported being a bit worried, 10% reported being quite worried and 3% reported being very worried (Wardle et al., 2000). Again, differences in measurement as well as geographic location (different countries) may explain the incongruence between our study and this prior findings. In the current study, multivariable analyses revealed that perceived susceptibility and social influence were significant predictors, whereas salience and coherence was marginally significant. As all of the participants were non-adherent to CRC screening, the finding that individuals reporting that ‘important others’ supported their completion of CRC screening revealed higher levels of cancer worry is interesting. It may be that this increased worry (among the non-adherent population) was related to recognizing that CRC screening was important to other individuals in their own social network.

Prevalence and Predictors of Worry of CRC Test Results

Thirty-five percent of participants reported moderate-to-high worry about CRC test results. A higher percentage of participants in our study reported moderate-to-high cancer worry compared to a sample of US male autoworkers in which 17% reported high levels of CRC test worry (Watts et al., 2003). Marital status and perceived susceptibility were significant predictors of worry about CRC test results in multivariable analyses. In a prior study conducted among African Americans in Southeast Florida, no sociodemographic predictors, including marital status, were associated with worry about CRC test results (McKinney & Palmer, 2014). It is not entirely clear why marital status might predict worry about CRC test results, but not the other types of cancer worry. Still, it may be that those who were married/partnered would worry more about what the concreteness of having a positive test result might mean for their spouse/partner. However, individuals who were divorced/widowed compared to those who were single were also more likely to report worry about positive CRC results. More research is needed to understand this association.

Strengths and Limitations

The current study has a number of strengths and limitations. In terms of strengths, the study compared prevalence and predictors of three different types of cancer worry to better understand differences in sociodemographic, healthcare experience, and cognitive predictors. Our findings demonstrated that, indeed, different predictors may be associated with various types of cancer worry, and furthermore, the magnitude of these associations may differ. Second, results provide insight into possible modifiable cognitive factors related

to cancer worry, as few sociodemographic factors predicted cancer worry. Third, the study included a diverse group of participants utilizing community-based clinics which provide medical services to a large number of medically-underserved individuals who were recruited in both rural and urban areas.

Limitations also should be acknowledged. First, the study was conducted in the context of a larger RCT testing two CRC screening interventions which may have attracted participants with characteristics different from those unwilling to participate. Second, our study focused upon general cancer worry, CRC worry, and CRC test worry and findings cannot be generalized to worry about other cancer types; prior research has suggested that cancer worry may vary by cancer type (McQueen, Vernon, et al., 2008; Moser et al., 2007). Previous studies have found that levels of CRC cancer worry were lower than for general cancer worry and worry about two gender-specific cancers (i.e., prostate and breast) among men and women (McQueen, Vernon, et al., 2008; Moser et al., 2007). Third, the study features a cross-sectional design, and thus, causality cannot be inferred. A prior study found that higher worry predicted sigmoidoscopy and colonoscopy receipt, but not FOBT completion (Moser et al., 2007). Baseline CRC test specific cancer worry did not predict subsequent FIT kit uptake in our larger RCT study (Davis et al., 2016). Further, the study does not take into account whether these types of cancer worry change in response to intervention. Finally, participants were individuals accessing health care services at community-based clinics in a limited geographic region, which may limit generalizability.

Future Directions

Findings suggest a number of future directions. First, it is important that studies clarify what type of cancer worry is measured (e.g., general cancer worry, CRC-specific cancer worry, worry about test results) rather than utilizing a blanket term of “cancer worry” (Hay et al., 2005). Second, future studies should clearly outline how cancer worry was measured and the prevalence of the various levels of cancer worry within the study population. Third, future studies might consider measuring multiple types of cancer worry in diverse populations and settings to better characterize participants’ emotional responses to the threat of cancer (Hay et al., 2005). Fourth, although our study did not find racial differences when comparing White, non-Hispanic participants versus all other ethnic/racial groups, additional research is needed to understand different types of cancer worry in more diverse populations with sufficiently large numbers of participants in multiple racial groups (Consedine et al., 2004). Finally, future longitudinal studies should measure cancer worry at various time points to determine how cancer worry may change over time, especially in response to any interventions delivered. Our study was conducted in the context of a larger RCT in which the various types of cancer worry were measured longitudinally both prior to and following a CRC cancer screening intervention. This will allow us to consider changes in cancer worry over time as well as the role of the various types of cancer worry in subsequent CRC screening uptake. Once the relationships of the different types of cancer worry with CRC screening is known, it is conceivable that interventions could address both cognitive predictors and cancer worry to increase screening uptake. It is also important to consider the timing of assessments of cancer worry. For example, it could be that cancer worry fluctuates based upon engagement in cancer behaviors and/or receipt of cancer screening results.

Specifically, worry may be low or moderate for most individuals prior to cancer screening, increase initially following completion of a screening (while waiting for result), and then decrease if test results are negative. Thus, within-person variations of the different types of cancer worry should be considered.

Findings suggest that it may be important to measure all three types of cancer worry in future research. However, the need for measurement of the different cancer worry constructs may be context-specific, depending upon the study question. As noted previously, differences in how cancer worry is measured across studies (e.g., item content and response options—frequency vs. magnitude) present challenges in making between-study comparisons. Notably, across the three cancer worry types, predictors of cancer worry were generally cognitive factors which may be malleable to change through intervention. Indeed, few demographic variables were predictors of cancer worry, with the exception of marital status in the case of worry about CRC test results. This finding may suggest an effect of social support and requires further exploration to assess implications. It is also important to note that there were no ethnic/racial differences across the three cancer worry types. Contrary to our results, a prior study revealed racial/ethnic differences in general cancer worry among participants (Vrinten et al., 2014).

Clinical Implications

The current paper sought to highlight the prevalence of three types of cancer worry in a racially- and ethnically-diverse population of patients seeking primary care services, and to highlight sociodemographic and health belief factors that may be associated with different cancer worry types. Patients may or may not be forthcoming with emotions surrounding cancer screenings. Clinicians may want to consider addressing these emotions with their patients as prior literature suggests that the role of cancer worry in screening behavior may differ dramatically—it may facilitate screening behavior, may be a barrier to screening, moderate levels may be necessary, and other factors, such as self-efficacy, may be necessary to facilitate screening behavior (Consedine et al., 2004; Hay et al., 2005; Hay et al., 2006). The aim of these discussions may not be to change patients' level of cancer worry, but rather to acknowledge that patients may have emotional concerns related to cancer, specific cancers, and screening tests and that certain factors may indicate patients with higher levels of cancer worry. For example, our findings suggest that individuals who reveal beliefs about increased risk of cancer may especially be worried about developing cancer. As such, nurses and other health care providers should have discussions with their patients about cancer prevention, and talk through what cancer screening means to them (e.g., Do they feel particularly susceptible to cancer? Are they worried what the results may show?). Such discussions open the door to understanding patients' feelings and emotions that may be associated with cancer screening. It also provides an important window into patients' readiness for screening and a "teachable moment" to deconstruct screening information and decipher patients' emotions. Ultimately, this facilitates well-informed screening decisions, can lead to improvements in health, and contributes to patient-centered care and better health outcomes.

Conclusions

In a racially- and ethnically-diverse population, 47% of participants reported experiencing moderate-to-high levels of general cancer worry, whereas 23% and 35% of individuals reported moderate-to-high levels of CRC-specific cancer worry and CRC test worry, respectively. Perceived susceptibility was a consistent predictor across all three types of cancer worry, but other predictors varied between cancer worry constructs. Researchers should consider measuring multiple cancer worry constructs as different predictors may be associated with various types of cancer worry and the magnitude of associations may change depending upon the cancer worry construct measured. Research findings have implications for future intervention studies as cancer worry may be modifiable.

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Ethical Conduct of Research

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. This article does not contain any studies with animals performed by any of the authors. Informed consent was obtained from all individual participants included in the study.

Table 1
Descriptive statistics and univariate prediction for all sociodemographic and health-belief variables ($N = 416$)

Variable	M or N	SD or %	General Cancer Worry			CRC Worry			CRC Test Worry		
			Unadjusted OR	95% CI		Unadjusted OR	95% CI		Unadjusted OR	95% CI	
Age	55.7	4.1	0.99	0.94, 1.03		0.99	0.94, 1.05		0.99	0.94, 1.04	
Female	223	54%	1.47	1.00, 2.17		0.81	0.51, 1.27		1.28	0.85, 1.92	
White, non-Hispanic	243	59%	1.37	0.92, 2.03		1.00	0.64, 1.59		1.10	0.73, 1.65	
Marital Status											
Married/partnered	129	31%	0.62	0.36, 1.04		0.60	0.33, 1.09	1.84 *		1.03, 3.29	
Divorced/separated/widowed	186	45%	0.94	0.58, 1.53		0.64	0.37, 1.10	2.16 ***		1.26, 3.73	
Single/never married	101	24%	REF			REF		REF			
Education											
Less than HS diploma/GED	100	24%	1.51	0.91, 2.52		1.21	0.68, 2.18	1.27		0.75, 2.14	
HS diploma/GED	165	40%	1.35	0.86, 2.10		1.07	0.63, 1.80	0.93		0.58, 1.48	
Beyond HS diploma/GED	151	36%	REF			REF		REF			
Employment status											
Full- or Part-time	101	31%	0.59	0.32, 1.09		1.18	0.59, 2.38	0.76		0.41, 1.43	
Unemployed	195	47%	0.69	0.40, 1.18		1.00	0.53, 1.89	0.92		0.53, 1.60	
Student/Homemaker	17	4%	0.71	0.25, 2.06		1.00	0.29, 3.46	0.48		0.14, 1.63	
Retired	31	7%	0.75	0.32, 1.74		0.62	0.21, 1.87	0.64		0.26, 1.60	
Unable to work	72	17%	REF			REF		REF			
Health insurance: Yes	256	62%	1.15	0.77, 1.71		1.00	0.63, 1.60	1.01		0.67, 1.52	
Regular physician: Yes	269	65%	1.03	0.69, 1.54		1.11	0.69, 1.79	1.61 *		1.04, 2.50	
Prior cancer screening: Yes	130	31%	1.12	0.74, 1.69		1.37	0.85, 2.21	0.71		0.45, 1.11	
Awareness Score	6.3	2.1	1.04	0.95, 1.14		1.07	0.96, 1.19	1.01		0.92, 1.11	
PHM Salience and Coherence	18.7	1.8	1.17 **	1.04, 1.31		1.22 **	1.06, 1.41	0.97		0.87, 1.09	
PHM Perceived Susceptibility	8.6	2.9	1.21 ***	1.13, 1.30		1.48 ***	1.33, 1.64	1.25 ***		1.15, 1.35	
PHM Response Efficacy	8.7	1.6	1.05	0.93, 1.19		1.21 *	1.03, 1.42	1.01		0.89, 1.15	

Variable	M or N	SD or %	General Cancer Worry		CRC Worry		CRC Test Worry	
			Unadjusted OR	95% CI	Unadjusted OR	95% CI	Unadjusted OR	95% CI
PHM Social Influence	14.9	3.8	1.12 ***	1.06, 1.18	1.18 ***	1.11, 1.27	1.06 *	1.01, 1.12
PHM Religious Beliefs	11.3	5.2	1.00	0.97, 1.04	1.05 *	1.00, 1.09	1.06 *	1.01, 1.09
PHM Self-efficacy	28.6	2.6	1.02	0.94, 1.10	1.06	0.96, 1.16	0.91	0.84, 0.98
Decisional Conflict	12.7	4.7	0.99	0.95, 1.03	0.98	0.94, 1.03	1.04	1.00, 1.09
Cancer Fatalism	4.3	3.2	1.00	0.95, 1.07	1.02	0.95, 1.09	1.08 *	1.01, 1.14
Trust in Healthcare System	24.2	6.7	1.00	0.97, 1.03	1.00	0.96, 1.03	1.02	0.99, 1.05
Perceived Discrimination	13.5	4.6	1.04	1.00, 1.09	1.05 *	1.00, 1.01	1.06 *	1.01, 1.10
Health Literacy	6.1	2.5	0.98	0.91, 1.06	0.93	0.85, 1.01	1.04	0.96, 1.13

Note: CRC = colorectal cancer; PHM = Preventive Health Model.

* $p < 0.05$,

** $p < 0.01$,

*** $p < 0.001$.

Table 2

Results of multivariable models

Variable	General Cancer Worry		CRC Worry		CRC Test Worry	
	Adjusted OR	95% CI	Adjusted OR	95% CI	Adjusted OR	95% CI
Marital Status	–		–			
Married/partnered					2.00 [*]	1.07, 3.73
Divorced/separated/widowed					2.26 ^{**}	1.26, 4.05
Single/never married					REF	
Regular physician: Yes	–		–		0.99	0.63, 1.55
PHM Salience and Coherence	1.14 [*]	1.01, 1.28	1.18	1.00, 1.40	–	
PHM Perceived Susceptibility	1.18 ^{***}	1.09, 1.27	1.40 ^{***}	1.26, 1.56	1.23 ^{***}	1.13, 1.33
PHM Response Efficacy	–		1.10	0.93, 1.33	–	
PHM Social Influence	1.07 [*]	1.01, 1.13	1.10 [*]	1.02, 1.19	1.02	0.96, 1.08
PHM Religious Beliefs	–		1.00	0.95, 1.05	1.02	0.98, 1.07
Cancer Fatalism	–		–		1.03	0.95, 1.11
Perceived Discrimination	–		1.04	0.99, 1.10	1.03	0.99, 1.08

Note: For each of the primary outcomes, the results of the multivariable model are presented. Variables were included if statistically significant in a univariate model (Table 1).

PHM = Preventive Health Model.

^{*} $p < 0.05$,

^{**} $p < 0.01$,

^{***} $p < 0.001$.