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Cancer-Specific Beliefs and Survival in Non-metastatic Colorectal Cancer Patients

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Abstract

BACKGROUND—Colorectal cancer (CRC) is the third leading cause of cancer mortality in the U.S. Associations between cancer-specific beliefs (beliefs) and survival have been observed among other cancer populations, but similar research in CRC patients is virtually non-existent, especially in racially-diverse populations. The relationship between beliefs and survival was investigated in a cohort of African-Americans and non-Hispanic Whites with newly diagnosed non-metastatic CRC, followed for up to 15 years.

METHODS—We analyzed data from a population-based cohort of 286 individuals (115 African-Americans and 171 Whites, approximately 52% women) diagnosed with non-metastatic CRC in Connecticut, 1987–1991. Cox proportional-hazards models were adjusted for socio-demographic (age, sex, race, education, income, occupational status, marital status) and biomedical (stage at diagnosis, histological grade, treatment) variables.

RESULTS—Not believing in the curability of cancer increased the risk of all-cause mortality (Hazard Ratio (HR)=1.59, 95% confidence interval (CI)=1.06, 2.39) and CRC-specific mortality (HR=1.65, 95% CI=0.90, 3.03, p=0.10). These multivariate estimates were not altered by additional adjustment for insurance coverage, obesity, smoking, alcohol consumption, or comorbidity. Further, the association between perceived curability and survival did not vary significantly by key socio-demographic or biomedical factors. Other beliefs were not associated with survival.

CONCLUSIONS—Among a racially diverse cohort of men and women with CRC, believing in the curability of cancer was independently associated with survival over a 15-year period. Confirmation of the role of cancer-specific beliefs on survival and study of the potential bio-behavioral mechanisms is needed. Findings may inform the design of interventions for cancer survivors.

Keywords

African-Americans; beliefs; colorectal carcinoma; psychosocial; survival

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Colorectal cancer (CRC) is the third most commonly diagnosed non-melanoma skin cancer and the third leading cause of cancer death among U.S. men and women. It is estimated that, in 2009, 146,970 individuals were diagnosed with CRC and almost 50,000 people died of the disease in the U.S alone.[1] Approximately 75% of all cases will be diagnosed at a local or regional stage for which the five-year relative survival rates are 90% and 68%, respectively. However, the mortality rates for CRC are 1.40 times higher in African-Americans than in non-Hispanic Whites, regardless of gender. [1,2] Furthermore, although death rates have decreased since 1990, the racial gap has widened as Whites have benefited to a larger extent from this decline than African-Americans. [2] A significant portion of the disparity is explained by a later stage at diagnosis; however, African-Americans exhibit a lower five-year survival rate at each stage of diagnosis[2] which in part reflects racial differences in socio-economic status,[3] access to high-quality treatments, and differences in tumor biology.[4]

Previous research has demonstrated associations between psychosocial factors and survival among individuals diagnosed with female breast cancer, [5–8] prostate cancer [9] and other cancers [10,11] though the evidence is inconclusive.[12] Possible mechanisms linking psychosocial factors to survival involve psychoneuroimmune and endocrine pathways, including the body's physiological response to the stress produced by the diagnosis and the disease, [13–15] as well as behavioral pathways (health behaviors and disease-monitoring).[15–18] Among psychosocial factors, cancer-specific beliefs and knowledge have been associated with breast and prostate cancer screening among healthy individuals, follow-up to abnormal test results, and stage at diagnosis and survival among cancer patients.[7,16,19–22] However, to our knowledge, most psychosocial research regarding cancer survival has focused on breast and lung cancer patients, and has generally not included large numbers of minority study subjects. Regarding CRC survivors, recent studies have focused on predictors of quality of life,[23,24] stage of disease at diagnosis as a predictor of psychosocial factors,[25] and psychosocial factors in relation to health behavior changes.[26,27]

In this follow-up study, we examined whether beliefs regarding cancer detection, treatment, and curability are associated with survival (up to 15 years) in a population-based cohort of African-American and White men and women diagnosed with non-metastatic CRC in Connecticut between 1987 and 1991. We restricted the study to non-metastatic CRC because five-year relative survival from metastatic CRC is poor (11% for colon cancer and 12% for rectal cancer)[28] and more likely to be driven by biomedical, as opposed to psychosocial, determinants. Guided by Krieger's Ecosocial Theory [29] and Szapocznick's Structural Ecosystems Theory, [30] we studied the association between cancer-specific beliefs and survival while accounting for the potential effect of macrosystem level factors, such as race, gender, socioeconomic status, marital status, insurance quality, and having a regular source of care. These factors, through direct and indirect processes, may influence access to and use of medical resources, as well as clinical course. At the microsystem level, we included individual-level characteristics such as clinical factors (e.g., tumor characteristics), co-morbidities, and lifestyle factors (tobacco and alcohol consumption). Further, capitalizing on the fact that our cohort of CRC survivors included both men and women, we explored whether these beliefs and/or their associations with survival varied across both race and gender, based on the existing evidence that health-related beliefs and behaviors are influenced by culturally-based norms. [5,31–33]

MATERIALS AND METHODS

Subjects

Data for this investigation originated from a larger population-based study of racial differences in cancer outcomes among individuals recently diagnosed with breast, colorectal, prostate, or endometrial carcinoma. Cases were identified through a rapid case-ascertainment system that included 22 Connecticut hospitals in which 98% of cancer cases in African-Americans were diagnosed according to 1984–1985 data from the Connecticut Tumor Registry (CTR), a SEER (Surveillance, Epidemiology, End Results) Program site since 1973. Exclusion criteria included distant metastasis of CRC (Stage IV at diagnosis), prior malignancy (same or different site, except non-melanoma skin cancer), race other than African-American or non-Hispanic White (White), not residing in Connecticut, non-English-speaking, and older than 79 years of age. For each African-American eligible case, a White case was randomly selected from among all eligible White cases diagnosed in the same hospital and within the same one-to-three week period as each eligible African-American case. The participation rate was 53% and did not vary significantly by race or gender. The sample included 286 individuals, 115 (40%) African-Americans, 171 (60%) Whites, and 149 (52%) women and 137 (48%) men, diagnosed with non-metastatic CRC in Connecticut between January 1987 and April 1991. The slight departure from the intended 1:1 African-American/White ratio occurred in the earliest phase of the recruitment (before all hospitals were enrolled in the surveillance network), during which more than one White case was selected for every African-American case for administrative reasons. Forty-six percent of patients were interviewed within four months of diagnosis, 83% within six months, and over 97% within a year of diagnosis.

In-person interviews were conducted in participants' homes (in most cases) by trained interviewers using a standardized instrument. This instrument was a modified version of the questionnaire used in the National Cancer Institute Black/White Cancer Survival Study 34 and collected extensive information on socio-demographic, health history, medical care, and psychosocial factors. Hospital records were abstracted and copies of key medical records were obtained (e.g., pathology and operative reports) for all cases to provide complete information on stage at diagnosis components and medical history. Approvals from the Human Investigation Committees of the Connecticut Department of Public Health and the Yale University School of Medicine, as well as the institutional review boards of each participating hospital, were obtained for all phases of this study. Accordingly, informed verbal consent was obtained at the time of in-person interviews but was waived (with approvals of the funding agency, Yale School of Medicine Human Investigations Committee, and all participating hospital IRBs) at the time of this follow-up study.

Primary Variables

Mortality—We accessed the CTR data late in 2002 to determine vital status, date of last contact, and specific cause of death (underlying cause of death determined from the death certificate) for each case. In addition, data from follow-up surveys with physicians involved in each participant's care contributed to ascertainment of vital status and date of last known contact (see below). Nevertheless, in order to avoid potential misclassification problems regarding specific cause of death, the outcome of primary interest in this study was survival until death from any cause (146 events), and our secondary outcome was CRC-specific mortality (72 events). We defined survival as time from CRC diagnosis until death or censoring by last contact date. The median survival for the whole sample was 10.5 years (range: 0.2 to 15.5 years).

Cancer-Specific Beliefs—The baseline interview included questions about participants' beliefs regarding cancer treatment, curability, and tumor detection (hereafter referred to as "beliefs"). These items were identified from the available literature and a limited number of available studies addressing cancer and health beliefs in diverse populations at the time of the initial data collection. Participants were asked whether they strongly agreed, agreed, neither agreed nor disagreed, disagreed, or strongly disagreed with the following statements:

1) “surgery can expose cancer to air and cause it to spread to other parts of the body” (surgery/air spread cancer); 2) “most cancers can be cured” (recoded in the opposite direction: most cancers *cannot* be cured); 3) “cancer treatment is worse than the disease” (Tx worse than cancer); and 4) “a regular doctor’s checkup would not detect the presence of cancer unless a person already has one of the seven warning signals” (checkup won’t detect cancer). Items were recoded in the same direction, whereby higher scores correlated, hypothetically, with an increased risk of death. Based on preliminary analyses, we recoded these variables into dichotomies (agree or strongly agree versus disagree, strongly disagree, neither agree nor disagree, or don’t know). In addition, because these items reflected beliefs rather than knowledge, we combined the response category “Don’t Know” with the middle category (neither agree nor disagree).

Study Covariates: Unless otherwise specified, multivariate models were adjusted for several known prognostic factors and potential confounders. Baseline *socio-demographic variables* included age (continuous), gender, race (self-identified), marital status (married or living as married vs. single), education (0–11 vs. ≥12 years of school completed), family annual income (dichotomized at the median, $25,000), and occupational rank (an adaptation of the combined spouse pair score on the Duncan Socio-economic Index (SEI), 35, 36 dichotomized at the median). Baseline *medical care variables* included whether respondents had a regular doctor and a measure of the quality of patients’ insurance coverage.

Clinical factors were determined from the baseline interview and from medical records collected at baseline and follow-up. Based on original pathology reports and medical records, two study physicians independently assigned tumor stage at diagnosis and tumor grade to each case. Inter-rater differences were resolved by case conference. All physicians named by study subjects as their primary care providers, surgeons, radiologists, or oncologists at the time of the in-person interview were sent a questionnaire at the time of follow-up (2002), in which information on vital status, date of last known contact, and treatment received was surveyed. These data confirmed and/or supplemented self-report and medical record information collected within a year of diagnosis, as well as CTR data accessed at follow-up.

Clinical factor covariates included TNM (tumor-node-metastasis) stage at diagnosis based on the American Joint Committee on Cancer (AJCC) staging system.37 TNM stage at diagnosis was classified into three categories: Stage 0 (In Situ)/Stage I, Stage II, and Stage III. We also included tumor grade (poorly differentiated versus moderately or well-differentiated), anatomical subsite (proximal versus distal), treatments received (radiation therapy, chemotherapy) (as only one study subject received immunotherapy and all but one underwent surgical treatment, these variables were omitted from tables and analyses), self-reported body mass index (BMI) (obese (greater than or equal to 30.0 kg/m^2) vs. underweight, normal, or overweight (less than 30.0 kg/m^2)) based on the National Institutes of Health (NIH) classification, 38 a baseline comorbidity index (defined as the number of major medical chronic conditions for which participants reported seeing a physician in the previous year; range: 0–11 conditions), family history of any cancer, and family history of CRC. Because almost all tumors were classified as adenocarcinomas (94%) we did not include histological type in the analyses.

Finally, multivariate models were adjusted for two baseline health behaviors: smoking (ever regular smoker for more than 6 months vs. never) and alcohol consumption (occasional or regular drinker vs. never).

Statistical Analyses: We used logistic regression to evaluate racial differences in participants’ characteristics as well as racial and gender differences in participants’ beliefs.

Survival analyses were performed using multivariate Cox proportional hazards regression. Cases with missing data on family income or occupational rank were retained in the analyses by including missing categories in multivariate models. There were no significant racial differences in missing data for these variables. We included core covariates (race, gender, age, marital status, education, income, occupational rank, stage at diagnosis, histological grade, and treatment) in multivariate models *a priori*. We pruned other potential covariates from the final survival model that had p-values greater than 0.20, that did not modify the association between predictors and outcome, or that failed to improve the goodness-of-fit of the model significantly. Graphical and model-based techniques were used to test whether the proportional hazards assumption was violated. 39

RESULTS

General Characteristics

Participants' characteristics by race are shown in Table 1; all comparisons were age-and gender-adjusted. When appropriate, comparisons were adjusted for marital status also (see footnotes to the table). African-Americans in our sample were diagnosed at a younger age than Whites (mean age at diagnosis: 60 vs. 66, respectively); more likely to report less than 12 years of education (50% vs. 36%), family income below the group median of $25,000 (73% vs. 60%), and lower occupational score (68% vs. 36% below the median); and less likely to be married or living as married (55% vs. 65%). Regarding health behaviors, African-Americans were less likely than Whites to report alcohol consumption (61% vs. 78%) and having ever smoked for more than 6 months (60% vs. 65%). Finally, the two groups did not vary significantly regarding gender, medical care factors (having a regular doctor, quality of insurance coverage), or clinical factors (TNM stage at diagnosis, histological grade, comorbidity, and treatment) except that African-American patients were more likely to report a BMI high enough to be classified as obese (25% vs. 11%).

Survival

The median follow-up period for the total sample was 10.5 years with a maximum of 15.5 years. By the end of the follow-up period, 146 (51%) participants died from any cause (40% African-Americans and 60% White, 53% men and 47% women). The observed differences in risk of mortality from any cause between African-American and White participants after adjusting for the core covariates (except race) did not reach statistical significance (HR for African-Americans =1.20; 95% CI=0.82, 1.76). However, after adjusting for the core covariates (except gender), men had more than twice the risk of mortality during the follow-up period compared to women (HR= 2.07; 95% CI=1.39, 3.08).

Of the total 146 deaths, 71 (49%) were classified as CRC deaths (51% African-Americans and 49% Whites; 58% men and 42% women). The difference in risk of mortality from CRC between African-American and White participants after adjusting for the core covariates (except race) was borderline significant (HR for African-Americans=1.71; 95% CI=0.99, 2.93; p=0.05). After adjusting for the core covariates (except gender), men had more than twice the risk of CRC-specific mortality during the follow-up period compared to women (HR= 2.42; 95% CI=1.35, 4.35).

Cancer-specific Beliefs

Table 2 shows percentages of participants' responses to the belief items by race. Because missing data varied by item, we included the corresponding denominators. Thus, for instance, of the 111 African-Americans *who answered* the item about surgery exposing cancer to air causing it to spread, 58 agreed with the item (52%) and 53 did not (48%). Contrasting responses by racial group, African-Americans were more likely than Whites to believe that surgery exposes cancer to air causing it to spread (52% vs. 36%) and that regular checkups will not detect cancer unless signs are present (58% vs. 45%). A higher percentage of Whites reported believing that most cancers cannot be cured (27% vs. 18%) and that cancer treatment is worse than the disease (36% vs. 25%). Using multivariate logistic regression, we adjusted for the core covariates (except race). African-Americans were almost twice as likely to believe that regular checkups would not detect cancer unless signs were present (Odds Ratio (OR)=1.95, 95% Confidence Interval (CI)=1.07, 3.54).

Table 3 shows similar comparisons by gender. In our sample, women were slightly more likely than men to believe that cancer treatment is worse than the disease (35% vs. 28%) and that regular checkups will not detect cancer unless signs are present (54% vs. 46%). Percentages did not vary regarding the other two beliefs. After multivariate adjustment for the core covariates (except gender), the gender difference regarding regular checkups not detecting cancer was statistically significant, with men less likely than women to hold this belief (OR=0.55, 95% CI=0.31, 0.96).

In Table 4 we show the association between agreeing with each belief and the vital status of the participants at the end of the 15-year follow-up period. Using the first item as an example, of the 118 individuals *who agreed* that surgery exposes cancer to air and causes it to spread, 64 (54%) were deceased whereas 54 (46%) were alive. The corresponding hazard ratio (HR= 1.17, CI= 0.81–1.68) compared those percentages in a multivariate Cox proportional hazards regression model controlling for the core covariates. After this adjustment, only the belief that most cancers cannot be cured showed a statistically significant association with poor survival (HR=1.59, CI=1.06–2.39).

Table 5 shows results of Cox regression analyses for incremental models for the association between perceived incurability of cancer and all-cause mortality. This table shows the confounding effect of the biomedical factors on the association between perceived incurability and survival, i.e., the increase in the estimate between Models 1 and 2. After adjustment for sociodemographic variables (age, gender, race, education, income, marital status, and occupational rank), perceived incurability was not associated with increased risk of mortality (HR=1.30; 95% CI=0.88, 1.93) (p=0.19; Model 1). Additional adjustment for biomedical variables (TNM stage at diagnosis, histological grade, and treatment received) (Model 2) strengthened the association, indicating negative confounding by these key prognostic variables. In Model 2 the estimate for the variable of interest reached statistical significance (HR=1.59; 95% CI=1.06, 2.39; p=0.03). Additional adjustment for insurance coverage, regular source of care, comorbidities, BMI, smoking, alcohol and time elapsed between diagnosis and interview did not alter this finding materially.

The multivariate Cox regression model (Model 2) for CRC-specific mortality yielded an association approaching significance between perceived incurability of cancer and survival (HR= 1.65; 95% CI= 0.90, 3.03; p=0.10). The estimate was similar to the one for all-cause mortality but the lower number of outcomes (CRC-specific deaths) decreased the power of the analysis and the estimate failed to achieve statistical significance. Again, further adjustment for insurance coverage, regular source of care, comorbidities, BMI, smoking, alcohol and time elapsed between diagnosis and interview did not alter this finding materially.

To investigate whether the effect of perceived incurability varied by socio-demographic or prognostic factors, we tested interactions of perceived incurability with the following variables: age, race, gender, education, stage at diagnosis, histologic grade, and treatment received. We failed to detect any significant interactions. Finally, because the Proportional

Hazards assumption did not hold for perceived incurability, the reported estimate represents an average effect of the variable over the follow-up period. [39]

DISCUSSION

We studied the association between cancer-specific beliefs and mortality prospectively in a population-based cohort of African-American and White men and women with newly diagnosed non-metastatic CRC. Our multivariate Cox regression model adjusting for relevant socio-demographic and biomedical variables showed that patients who believed that most cancers *cannot* be cured had a 59% increased risk of mortality in the 15-year period following diagnosis. Furthermore, this finding was specific with respect to the four beliefs examined, with the other three beliefs showing no association with mortality. Thus, we have identified a potential specific, clinically relevant psychosocial marker for individuals at risk for poor outcomes. Importantly, we found the same specific association between the belief that most cancers cannot be cured and mortality among breast cancer, [7] indicating the robustness of this finding across major cancer types.

In terms of outcome disparities across race, our multivariate results suggested that African-American and White participants had similar survival outcomes regarding all-cause mortality, but African-Americans had a higher risk of CRC-specific death than Whites. These findings are consistent with previous results, [2, 3, 40–42] except in populations where both groups received similar treatment and care, in which case disparities almost disappeared.[43, 44] A recent meta-analysis concludes that racial differences in survival are greatly reduced when accurate measures of treatment quality and socioeconomic factors are taken into consideration.[45] With respect to a prognostic relationship between gender and CRC, we found that men diagnosed with CRC were at higher risk than women for all-cause mortality and CRC-specific mortality, as previously observed by others, [40, 42, 46] although the literature remains inconclusive. [40]

Regarding prevalence of cancer-specific beliefs by race and gender, we found African-Americans were more likely than Whites to believe that regular checkups would not detect cancer unless a person already had one of the seven warning signals. This belief is likely to influence early cancer detection.[47, 48] Evidence of race as an independent predictor of CRC screening remains inconclusive whereas race disparities in CRC stage at diagnosis have been observed consistently in the recent literature.[49] In our sample, women were also more likely than men to doubt the efficacy of regular checkups regarding cancer detection which supports the existing evidence that women are less likely to adhere to CRC screening guidelines. [48]

Taking into account the number of factors relevant to a cancer prognosis, a significant association between a psychosocial characteristic measured shortly after diagnosis and the relative risk of dying during a 15-year follow-up period is noteworthy and a potentially useful tool for quickly identifying individuals at risk for unfavorable outcomes. The underlying mechanisms for associations between psychosocial factors and survival are likely to include health protective behaviors,[26, 50–52] adherence to recommended medical protocols and monitoring of disease recurrence, [42, 53] as well as neuroimmunological, neuroendocrine, and other physiological pathways.[13–15]

A recent review[12] and a meta-analysis[15] concluded that, although current evidence regarding the role of psychosocial influences on prognosis is mixed, there is support for the effect of hopelessness, minimization of the impact of the cancer, emotional distress (especially depression) and stress-related psychosocial factors among individuals diagnosed with cancer. A recent prospective randomized clinical trial with an 11-year follow-up of breast cancer survivors concluded that an intervention designed to reduce cancer-specific distress was successful at significantly improving survival outcomes. 13 Although these factors were not measured explicitly as part of our study, the belief that most cancers cannot be cured among individuals recently diagnosed with cancer may reflect fear of recurrence or of a second primary tumor, which is likely to contribute to hopelessness and anxiety/distress. 26

Fatalistic views on cancer prevention and prognosis have been associated with poorer health promotion behaviors among cancer survivors. 54 Further, cancer survivors who believe that their cancer was caused by potentially controllable factors (stress, lifestyle, environmental exposures),55 that positive health behaviors may prevent recurrence, 51, 55 or who reported greater intrusive thoughts 26 were more likely to adopt healthier behaviors. These findings are relevant since incidence and/or mortality of CRC have been associated with smoking, 56–61 BMI, 62–65 physical activity,64, 66 and alcohol consumption. 67 Although we did not include BMI or smoking in the final model in the interest of parsimony, we did find that the associations of these variables with all-cause mortality and CRC-specific mortality approached statistical significance. However, neither variable confounded the association between perceived incurability and survival. Our measure of alcohol consumption did not show any association with survival and, due to data limitations, we were unable to examine the role of physical activity.

Unfortunately, despite their increased susceptibility to a recurrence, a second primary tumor, or secondary effects from treatment, cancer survivors tend to have health behavior profiles similar to those of the general population 68 and few meet current lifestyle recommendations. 69 However, some recent findings suggest that although cancer survivors may be receptive to improving their health behaviors 70, 71 their level of readiness to make lifestyle changes varies as much as that of healthy individuals.72

Fatalistic perceptions and/or sense of hopelessness regarding cancer curability may also impact adherence to medical protocols such as treatment 73 and post-treatment surveillance for recurrences and for missed synchronous lesions at initial diagnosis.42 Unfortunately, studies of prevalence of post-treatment surveillance (e.g., colonoscopy) in population-based cohorts of CRC survivors are scarce and limited by their retrospective design.42 To the authors' knowledge, there are no prospective studies examining psychosocial predictors of post-treatment surveillance among CRC patients.

In sum, perceived incurability of the disease may be a psychosocial marker for survivors at higher risk of harmful psychological factors (e.g., hopelessness) with physiological consequences, such as stress, and/or behavioral factors such as lack of adherence to lifestyle and medical surveillance recommendations.

Our study contributes to the almost non-existent research addressing psychosocial and cultural variables that may influence survival in a racially diverse cohort of cancer patients. 74 Our results are consistent with previous work on survivors of other cancers.7, 13, 73, 75, 76 However, a recent meta-analysis 15 supported the effect of psychosocial factors such as emotional distress/depression on cancer survival for other cancers but not for CRC.

These findings should be interpreted in the context of the study's limitations. The sample size (n=286), though fairly large for a population-based cancer survival study, may not have provided enough power to detect significant interactions between cancer-specific beliefs and participants' characteristics. Also, only one wave of psychosocial, socioeconomic, and health behavior information was collected shortly after diagnosis. While not an uncommon limitation, 6, 75 it does preclude the examination of how potential changes in beliefs across time and disease events (e.g., recurrence) may impact disease course and survival outcomes and, vice versa, how the disease course may impact beliefs. Similarly, though participants were asked about their communication with their physician, the data lack detailed information regarding what the patient was told by the physician at time of diagnosis regarding his or her prognosis which may have influenced the patient's perception about cancer curability. However, given the set of biomedical prognostic variables included in the analysis, we believe we have accounted for a large portion of post-baseline variability in disease course. Likewise, this adjustment accounted for the disease characteristics most likely to have informed physicians' prognosis and, presumably, their message to their patients regarding their prognosis.

Major strengths of this study include a population-based design, a large representation of African-American cancer patients (40% of the sample), a 15-year follow-up period, in-depth personal interviews, three individual-level measures of socioeconomic status, medical records abstraction, collection of registry survival and treatment data (supplemented with physician surveys at follow-up), standardized staging of cases, and statistical adjustment for socio-demographic, biomedical and health behavior prognostic factors.

In conclusion, in a population-based cohort of racially diverse men and women diagnosed with non-metastatic CRC, perceived curability of cancer was independently associated with long-term survival after adjusting for relevant prognostic factors and potential confounders. Longitudinal research is needed to confirm these findings and determine what combination of mediators in the bio-behavioral pathway explains the association between perceived curability and survival. The identification of specific psychosocial prognostic factors at time of diagnosis may be valuable in the identification of cancer patients at risk for unfavorable outcomes, and who may benefit the most from psycho-behavioral and cognitive interventions. Finally, ascertaining the mechanisms through which these factors affect survival and whether they vary by individual characteristics (e.g., gender, race, age) would facilitate the design of effective interventions targeting CRC survivors.

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Table 1

Selected Characteristics of Colorectal Cancer Patients, by Race, Connecticut, 1987–1991 (n=286)

Characteristics*	African-American (n=115)**		White (n=171)**		OR†	95% CI†
	No.	%	No.	%		
Sociodemographic Factors						
Mean age(Std)	59.7 (11.3)		66.0 (9.5)			p <0.0001
Gender						
Men	56	48.7	81	47.4	1.09	0.66–1.78
Women	59	51.3	90	52.6	1.00	
Education (years)						
0–11	57	49.6	61	35.7	2.79	1.61–4.82
≥12	58	50.4	110	64.3	1.00	
Annual family income‡£						
≤$24,999	71	72.4	93	60.0	2.52	1.29–4.91
≥$25,000	27	27.6	62	40.0	1.00	
Occupational Rank‡£						
Low Score	75	67.6	56	35.7	4.32	2.42–7.70
High Score	36	32.4	101	64.3	1.00	
Marital Status						
Single	52	45.2	60	35.1	2.71	1.49–4.91
Married/Living as married	63	54.8	111	64.9	1.00	
Medical Care Factors						
Regular doctor						
No	35	33.3	31	20.4	1.64	0.89–3.03
Yes	70	66.7	121	79.6	1.00	
Insurance Coverage£						
Poor/Moderate	48	42.1	57	34.1	1.31	0.78–2.22
Good	66	57.9	110	65.9	1.00	
Clinical Factors						
TNM Stage						

Characteristics*	African-American (n=115)**		White (n=171)**		OR†	95% CI†
	No.	%	No.	%		
Stage III	33	28.7	42	24.6	1.15	0.60–2.20
Stage II	43	37.4	59	34.5	1.41	0.79–2.52
Stages 0/I	39	33.9	70	40.9	1.00	
Histological Grade						
Poorly Differentiated	14	13.5	13	8.6	2.02	0.86–4.71
Moderate/Well Differentiated	90	86.5	138	91.4	1.00	
Body Mass Index§						
Obese	29	25.4	19	11.2	2.90	1.48–5.70
Normal or Overweight	85	74.6	151	88.8	1.00	
Comorbidity Index						
>2	60	55.0	109	66.1	0.88	0.51–1.50
0 – 2	49	45.0	56	33.9	1.00	
Chemotherapy	23	20.0	36	21.1	0.75	0.40–1.40
No Chemotherapy	92	80.0	135	78.9	1.00	
Radiation therapy	18	15.7	29	17.0	0.66	0.33–1.31
No Radiation therapy	97	84.3	142	83.0	1.00	
Behavioral Factors						
Alcohol Consumption						
Occasional/Regular	69	60.5	132	77.6	0.42	0.24–0.73
Never	45	39.5	38	22.4	1.00	
Regular Smoker						
Ever Regular > 6 mos	68	59.6	111	65.3	0.67	0.39–1.14
Never	46	40.4	59	34.7	1.00	

OR: odds ratio; 95% CI: 95% confidence interval; TNM: tumor, lymph node, metastasis.

[*] See Methods Section for definition of variables.

[**] Numbers for each characteristic may not sum to total because of missing data.

[†] OR, age- (continuous) and gender-adjusted odds ratio;

[‡] Dichotomized: ≤ median versus > median approximated from midpoint of categories

[£] Adjusted for marital status (Single vs. Married/Living as Married),)

[§] BMI = weight (kg)/height (m^2); categorized using NIH definitions (Underweight [<18.5], Normal [18.5–24.9], Overweight [25.00–29.9], Obese [≥30]).

Table 2

Multivariate-adjusted cancer-specific beliefs of colorectal cancer patients, by race, Connecticut, 1987–1991 (N=286)

Variable[*]	**African-American (n=115)**		**White (n=171)**		**Odds[†] Ratio**	**95% Confidence Interval**
	No.	**%**	**No.**	**%**		
Surgery/air spread cancer						
Agree	58/111	52.3	61/168	36.3	1.59	0.89–2.83
Don't agree	53/111	47.7	107/168	63.7	1.00	
Most cancers cannot be cured						
Agree	20/113	17.7	44/165	26.7	0.54	0.26–1.11
Don't agree	93/113	82.3	121/165	73.3	1.00	
Tx worse than cancer						
Agree	28/111	25.2	60/167	35.9	0.60	0.32–1.14
Don't agree	83/111	74.8	107/167	64.1	1.00	
Checkup won't detect cancer						
Agree	65/113	57.5	75/167	44.9	1.95	1.07–3.54
Don't agree	48/113	42.5	92/167	55.1	1.00	

[*] See Methods Section for definition of variables. Predictor variables are coded as a dichotomy: 1 (Agree/Strongly Agree) vs. 0 (Neither Agree Nor Disagree, Disagree/Strongly Disagree, Don't Know).

[†] Multivariate odds ratio adjusting for Age (continuous), Gender, Education (Grade 0–11 vs. ≥ Grade 12), Marital Status (Single vs. Married/Living as Married), Annual Family Income (<$25,000 vs. ≥ $25,000), Occupational Rank (≤ median vs. >median on the Duncan Socioeconomic Index35, 36 adapted for spouse pairs), Stage at Diagnosis (Stages 0/I, Stage II, Stage III), Histological Grade (Poorly Differentiated vs. Well or Moderately Differentiated), Radiation Therapy Received (yes vs. no) and Chemotherapy Received (yes vs. no).

Table 3

Multivariate-adjusted cancer-specific beliefs of colorectal cancer patients, by gender, Connecticut, 1987–1991 (N=286)

Variable[*]	**Men (n=137)**		**Women (n=149)**		**Odds**[†] **Ratio**	**95% Confidence Interval**
	No.	**%**	**No.**	**%**		
Surgery/air spread cancer						
Agree	58/132	43.9	61/147	41.5	1.19	0.67–2.10
Don't agree	74/132	56.1	86/147	58.5	1.00	
Most cancers cannot be cured						
Agree	30/134	22.4	34/144	23.6	1.11	0.57–2.16
Don't agree	104/134	77.6	110/144	76.4	1.00	
Tx worse than cancer						
Agree	37/132	28.0	51/146	34.9	0.66	0.36–1.19
Don't agree	95/132	72.0	95/146	65.1	1.00	
Checkup won't detect cancer						
Agree	61/134	45.5	79/146	54.1	0.55	0.31–0.96
Don't agree	73/134	54.5	67/146	45.9	1.00	

[*] See Methods Section for definition of variables. Predictor variables are coded as a dichotomy: 1 (Agree/Strongly Agree) vs. 0 (Neither Agree Nor Disagree, Disagree/Strongly Disagree, Don't Know).

[†] Multivariate odds ratio adjusting for Age (continuous), Race, Education (Grade 0–11 vs. ≥ Grade 12), Marital Status (Single vs. Married/Living as Married), Annual Family Income (<$25,000 vs. ≥ $25,000), Occupational Rank (≤ median vs. >median on the Duncan Socioeconomic Index[35, 36] adapted for spouse pairs), Stage at Diagnosis (Stages 0/I, Stage II, Stage III), Histological Grade (Poorly Differentiated vs. Well or Moderately Differentiated), Radiation Therapy Received (yes vs. no) and Chemotherapy Received (yes vs. no).

Table 4

Multivariate-adjusted cancer-specific beliefs of colorectal cancer patients, by Vital Status, Connecticut, 1987–1991

Variable*	**Deceased (n=146)**		**Alive (n=137)**		**Hazard Ratio**[†]	**95% Confidence Interval**
	No.	**%**	**No.**	**%**		
Surgery/air spread cancer						
Agree	64/118	54.2	54/118	45.8	1.17	0.81–1.68
Don't agree	75/158	47.5	83/158	52.5	1.00	
Most cancers cannot be cured						
Agree	35/62	56.5	27/62	43.6	1.59	1.06–2.39
Don't agree	104/213	48.8	109/213	51.2	1.00	
Tx worse than cancer						
Agree	50/85	58.8	35/85	41.2	1.14	0.78–1.66
Don't agree	89/190	46.8	101/190	53.2	1.00	
Checkup won't detect cancer						
Agree	68/140	48.6	72/140	51.4	0.89	0.62–1.27
Don't agree	72/137	52.6	65/137	47.4	1.00	

[*] See Methods Section for definition of variables. Predictor variables are coded as a dichotomy: 1 (Agree/Strongly Agree) vs. 0 (Neither Agree Nor Disagree, Disagree/Strongly Disagree, Don't Know).

[†] Multivariate Cox Regression adjusting for Age (continuous), Gender, Race, Education (Grade 0–11 vs. ≥ Grade 12), Marital Status (Single vs. Married/Living as Married), Annual Family Income (< $25,000 vs. ≥ $25,000), Occupational Rank (≤ median vs. >median on the Duncan Socioeconomic Index35, 36 adapted for spouse pairs), Stage at Diagnosis (Stages 0/I, Stage II, Stage III), Histological Grade (Poorly Differentiated vs. Well or Moderately Differentiated), Radiation Therapy Received (yes vs. no) and Chemotherapy Received (yes vs. no).

Table 5

Multivariate Hazard Ratios (95% confidence intervals) from Incremental Models for the Association Between Perceived Cancer Incurability and All-Cause Mortality Among Colorectal Cancer Patients, Connecticut, 1987–1991

Model and independent variables included[*]	**Main Predictor**[*]	**No. of Cases**	**Hazard Ratio**	**95% Confidence Interval**
Model 1: socio-demographic variables [†]	Most cancers cannot be cured	274	1.30	0.88–1.93
Model 2: Model 1 + Biomedical variables [‡]	Most cancers cannot be cured	274	1.59	1.06–2.39

[*] See Materials and Methods for variable definition. Predictor variable is coded as a dichotomy: 1 (Agree/Strongly Agree) vs. 0 (Neither Agree Nor Disagree, Disagree/Strongly Disagree, Don't Know)

[†] Age (continuous), Gender, Race, Education (Grades 0–11 vs. ≥ Grade 12), Marital Status (Single vs. Married/Living as Married), Annual Family Income (<$25,000 vs. ≥ $25,000), Occupational Rank (≤median vs. >median on the Duncan Socioeconomic Index[35, 36] adapted for spouse pairs).

[‡] Stage at Diagnosis (Stages 0/I, Stages II, Stage III), Histological Grade (Poorly Differentiated vs. Well or Moderately Differentiated), Radiation Therapy Received (yes vs. no) and Chemotherapy Received (yes vs. no).