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Racial-Ethnic Disparities in Late-Stage Colorectal Cancer Among Hispanics and Non-Hispanic Whites of New Mexico

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Abstract

Introduction: Hispanics in New Mexico are diagnosed with more later-stage colorectal cancer (CRC) than non-Hispanic Whites (NHW). Our study evaluated the interaction of race/ethnicity and risk factors for later-stage III and IV CRC among patients in New Mexico.

Method: CRC patients ages 30 to 75 years ($n = 163$, 46% Hispanic) completed a survey on key explanatory clinical, lifestyle, preventive health, and demographic variables for CRC risk. Adjusted logistic regression models examined whether these variables differentially contributed to later-stage CRC among NHW versus Hispanics.

Results: Compared with NHW, Hispanics had a higher prevalence of later-stage CRC ($p = .007$), diabetes ($p = .006$), high alcohol consumption ($p = .002$), low education ($p = .003$), and CRC diagnosis due to symptoms ($p = .06$). Compared with NHW, Hispanics reporting high alcohol consumption (odds ratio [OR] = 7.59; 95% confidence interval [CI] = 1.31–43.92), lower education (OR = 3.5; 95% CI = 1.28–9.65), being nondiabetic (OR = 3.23; 95% CI = 1.46–7.15), or ever smokers (OR = 2.4; 95% CI = 1.03–5.89) were at higher risk for late-stage CRC. Adjusting for CRC screening did not change the direction or intensity of the odds ratios.

Conclusion: The ethnicity—risk factor interactions, identified for late-stage CRC, highlight significant factors for targeted intervention strategies aimed at reducing the burden of later-stage CRC among Hispanics in New Mexico with broad applicability to other Hispanic populations.

Keywords

colorectal neoplasm; Hispanic Americans; epidemiology; risk factors; neoplasm staging; SEER Program

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Declaration of Conflicting Interests

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Introduction

The diagnosis of colorectal cancer (CRC) at later, more advanced, stages is a significant public health concern as it results in higher morbidity and mortality. The 5-year survival for persons diagnosed with local stage CRC is 89.9%, compared with 71.3% for regional stage and 13.9% for distant stage (Howlader et al., 2017). In New Mexico, as in other parts of the country, Hispanics are diagnosed with more advanced-stage CRC and have poorer 5-year CRC survival than non-Hispanic Whites (NHW; Arshad, Tetangco, Shah, Kabir, & Raddawi, 2016; Hernandez, Sussman, Lee, Mackinnon, & Fleming, 2012; Hoffman et al., 2014; Mobley & Kuo, 2017; Rodriguez et al., 2015). Similar to Hispanics across the United States, New Mexico Hispanics are less likely than NHW to be current with recommended CRC screening, which increases detection of early-stage CRC (Gonzales, Nelson, Rhyne, Stone, & Hoffman, 2012). Furthermore, the higher prevalence of physical inactivity, elevated body mass index (BMI), alcohol consumption, cigarette smoking, and diabetes among Hispanics compared with NHW in New Mexico indicates the potential for unique interactions between risk factors and race/ethnicity on the observed disparity in later-stage CRC. New Mexico is one of four majority-minority states in the United States where minorities, or those not identifying themselves as NHW, make up the majority of the population (U.S. Census Bureau, 2011). In 2016, Hispanics comprised 48.5% of the New Mexico population—an increase of 2.2% over 2010 (U.S. Census Bureau, 2016). The magnitude of the CRC disparity in stage of diagnosis may well increase as the Hispanic population in New Mexico and across the United States grows. Therefore, disparities in stage at diagnosis indicate a critical opportunity for cancer control efforts in New Mexico with broad applicability to other states that provide services to Hispanics.

The few studies that have examined late-stage CRC among Hispanics have relied on cancer registry or clinic data and imputed group-level risk factors to estimate trends and risk (Arshad et al., 2016; Hernandez et al., 2012; Mobley & Kuo, 2017). In the current analysis, CRC stage diagnosis obtained from clinic records and registry data were combined with individual-level self-reported measures of socioeconomic indicators, lifestyle factors, screening, and family history of CRC obtained from telephone interviews. To better characterize the ethnic-specific differences in advanced-stage CRC, the association between individual-level risk factors and late-stage CRC among Hispanic and NHW patients in New Mexico were evaluated. In-person clinic recruitment and phone-based registry recruitment methods were compared, and feasibility of telephone interviews among CRC patients were evaluated.

Method

Inclusion Criteria and Recruitment

Inclusion criteria included self-identified Hispanic and NHW patients, ages 30 to 75 years, with physician diagnosed CRC. Patients with familial polyposis were excluded. Although CRC screening is recommended to start at age 50, we included patients age 30 to 49 years due to increasing incidence of later-stage CRC among young Hispanics (Jafri, Gould, El-Serag, Duan, & Davila, 2013). The study protocol was approved by the University of New Mexico Health Sciences Center Human Research Protections Office.

Patients were recruited from regional surgical and medical oncology clinics located in Albuquerque, New Mexico, and through New Mexico Tumor Registry (NMTR) records for the same catchment area. Clinic recruitment took place between 2012 and 2015 at the time of a clinic appointment. On enrollment, patients provided informed consent, a phone number, and convenient time for the telephone interview. Site and stage of CRC were confirmed in the medical record by the clinic staff. The phone interview was conducted by a trained member of the study staff.

Registry recruitment began with identification of potential participants in the NMTR database. Registry staff queried the registry's data for CRC patients diagnosed between 2011 and 2014, living in the city of Albuquerque, in Bernalillo County, or in one of four nearby counties (Sandoval, Valencia, Torrence, or Santa Fe). The NMTR, a member of the National Cancer Institute's Surveillance, Epidemiology, and End Results (SEER) Program, primarily determines race/ethnicity from abstracting medical records. Hispanic ethnicity is assigned on the basis of specific statements in medical records augmented by identifying Spanish surnames and maiden names, when available (Becker, Wiggins, Elliott, Key, & Samet, 1993). After offering eligible patients and their physicians the opportunity to opt out of further contact concerning the study, the NMTR released contact information for recruitment. The study staff recruited, consented, and interviewed interested patients at the time of telephone contact between the years 2014 and 2015. If unable to contact a patient after three attempts, that patient was considered unavailable for interview. The NMTR released CRC site and stage information for consented and enrolled patients.

Survey Measures

The telephone interview included questions for key clinical, lifestyle, preventive health, and demographic variables related to CRC risk. Demographic variables included self-identified race/ethnicity and educational attainment (Goodkind, Gonzales, Malcoe, & Espinoza, 2008). Diagnosis of diabetes or prediabetes and history of cigarette smoking were assessed based on questions from the Behavioral Risk Factor Surveillance Survey (Centers for Disease Control and Prevention [CDC], 2006). Patients aged 50 years and older are also asked questions about CRC screening by fecal occult blood test, or sigmoidoscopy/colonoscopy, and when these tests were last performed (CDC, 2006). All patients were asked,

How did your (CRC) diagnosis occur? Was it because you went to see the doctor: for a regular check-up, for a routine colonoscopy, for symptoms or problems related to a condition, or for some other problem? (What was the condition or problem did you see the doctor for?).

Patients who were not adopted were asked about any known history of CRC among their immediate blood relatives (biological parents, full and half siblings and children, either living or deceased, but not adopted relatives).

The patients' "Referent age" was established as their age the year before CRC diagnosis. Height and weight at the Referent age was used to calculate BMI the year before diagnosis. Questions about alcohol consumption of the year before CRC diagnosis were based on the Alcohol Use Disorders Identification Test (World Health Organization, 1990), expanded to capture amount of alcohol consumed. If a patient answered "yes" to the question "Did you

drink an average of one or more alcoholic beverages a month at (Referent age)?” the following three questions were asked: How many cans or bottles of beer did you usually drink per week or per month at (Referent age)? How many glasses of wine did you usually drink per week or per month at (Referent age), and How many mixed drinks or shots of hard liquor did you usually drink per week or per month at (Referent age)?

Data Analysis

The American Joint Commission on Cancer stage at the time of diagnosis was used to classify cases into early-stage (I, II) and later-stage (III, IV) CRC groups. Diabetes and prediabetes were combined into a single category in the analyses as both conditions share similar physiological patterns of glucose dysregulation and insulin resistance and impairment. Patients who reported smoking more than 100 cigarettes in their lifetime were classified as “ever” smokers. Alcohol was reported as the average number of servings of beer, wine, or mixed drinks consumed per week during the year prior to CRC diagnosis, based on the CDC definition of 0.6 fl oz of alcohol per standard drinking (CDC, 2017). At-risk alcohol use (heavy drinking) was defined as 15 or more drinks per week for men, and 8 or more drinks per week for women (Bouchery, Harwood, Sacks, Simon, & Brewer, 2011). To be consistent with previous studies of the New Mexico population, current CRC screening was defined as having had a fecal occult blood test within the past year and/or colonoscopy within the past 10 years (Afable-Munsuz, Liang, Ponce, & Walsh, 2009; Gonzales et al., 2012).

The distributions of patient characteristics and risk factors were stratified by race/ethnicity and the two groups contrasted using the chi-square statistic to identify significant associations between individual risk factors, comorbidities, tumor stage, and race/ethnicity. Due to significant interaction between race/ethnicity and key explanatory variables, including education, alcohol consumption, and diabetes, individual logistic regression models were used to examine whether these factors differentially contributed to advanced-stage CRC among NHW versus Hispanics. In all logistic models, the odds ratio (OR) of late-stage CRC for different levels for the independent variables were calculated with their 95% corresponding confidence intervals (CI). To avoid having four interaction terms within one multiple logistic model, which in turns might lead to overfitting, four different models (1, 2, 3, and 4 as presented in Table 3) were explored. In each model were included one interaction term and all lower order terms (main effect) that were involved in it while adjusting for gender, age at diagnosis, BMI status, and family history of CRC (FHCRC). For example, in Model 3, the baseline adjusted model was built as follows:

$$\begin{aligned} \log(\pi / (1 - \pi)) = & \beta_0 + \beta_1 * \text{Gender} + \beta_2 * \text{Age} \\ & + \beta_3 * \text{BMI} + \beta_4 * \text{FHCRC} + \beta_5 * \text{Ethnicity} \\ & + \beta_6 * \text{Diabetes} + \beta_7 * \text{Ethnicity} * \text{Diabetes} \end{aligned}$$

where π denotes the likelihood of having late-stage CRC diagnosis. To evaluate the mediating effect of up-to-date CRC screening on stage at diagnosis, this explanatory variable was added in subsequent models (see baseline plus CRC screening models in Table 3) and the relative change in the beta coefficient for the primary exposure (Hispanic) was calculated

and compared to $\alpha = 10\%$. Mediating effects were evaluated according to MacKinnon, Fairchild, and Fritz (2007). All logistic regression models were assessed via the Hosmer, Hosmer, Le Cessie, and Lemeshow (1997) goodness-of-fit test.

Results

Recruitment

The clinics approached 249 patients (93.3% of eligible) for recruitment into the study. Of these, 195 (73.8%) were recruited and 139 completed a telephone survey (71.3%, of which 44.7% were Hispanic; Figure 1). The staff placed phone calls to 163 registry-identified patients (55% of eligible) for recruitment into the study. Of these, 55 patients were reached (33% contact rate), and 22 were recruited and completed the survey (60%, of which 36.5% were Hispanic).

Participant Characteristics

Patients recruited through the registry and the clinics were similar in age, smoking, and prediagnosis BMI, but differed in the prevalence of diabetes, later-stage CRC, and in the distribution of educational attainment (Figure 1). Compared with NHW, a greater proportion of Hispanics had diabetes ($p = .006$), lower educational attainment ($p = .003$), greater alcohol use ($p = .002$), and later-stage CRC ($p = .007$; Table 1). Among Hispanic patients, diabetes prevalence differed significantly between early-stage and late-stage CRC patients ($p = .018$; Table 2). Among NHW patients, there were no significant differences in the distribution of risk factors between early- and later-stage CRC patients (Table 2). CRC was diagnosed due to symptoms rather than screening in 74.2% of Hispanic and 59.3% of NHW patients ($p = .06$). Among patients over age 50, being up-to-date with CRC screening guidelines at the time of diagnosis was significantly lower among Hispanics compared with NHW ($p = .008$). Although Hispanics were more likely to report being nondrinkers than NHW in the year prior to CRC diagnosis (62.7% vs. 46.6%), among patients who reported alcohol consumption, Hispanics were more likely than NHW to report heavy drinking (17.3% vs. 8.0%).

CRC Risk Models

In logistic regression models adjusted for age at diagnosis, sex, BMI, and family history, the odds for later-stage CRC were significantly higher for Hispanics with higher educational attainment (OR = 3.15; 95% CI = 1.28-9.65), who consumed more than five alcoholic drinks per week (OR = 7.59; 95% CI = 1.13-43.92), who did not have diabetes (OR = 3.23; 95% CI = 1.46-7.15), or who had ever been smokers (OR = 2.47; 95% CI = 1.03-5.89) compared with NHW with the same risk factors (Table 3). Additional adjustment for adherence to CRC screening guidelines did not change the direction or intensity of the odds ratios for later-stage CRC diagnosis in Hispanics compared with NHW. For example, the odds ratio of later-stage CRC for Hispanics who had smoked cigarettes changed from 2.47 to 2.62 when screening was included, a change of about 6.5%, indicating negligible mediating; results of intermediate steps in evaluating the mediating effect are not shown. All logistic regression models presented a good fit according to Hosmer et al. (1997), $p > .05$.

Discussion

This study evaluated the differential effect of risk factors between Hispanic and NHW on later-stage CRC. There were significantly higher incidence of diabetes, lower educational attainment, higher alcohol use, and later-stage CRC among Hispanics patients compared with NHW patients. The risk for later-stage CRC among Hispanics was 7.6 times higher for those with heavy alcohol consumption, 3.5 greater for those reporting higher educational attainment, 3.2 times higher for nondiabetics, and 2.5 times higher for ever smokers, compared with NHW patients with the same risk factors, after adjusting for age at diagnosis, sex, BMI, and family history. Additional adjustment for being current with CRC screening at the time of diagnosis did not change the direction or intensity of the odds for advanced stage CRC. These findings suggest possible interventions within the Hispanic population with significant implications for later-stage CRC risk.

Few studies have examined the risk factors associated with Hispanic ethnicity and stage at CRC diagnosis and none have been conducted with individual-level measures of key explanatory socioeconomic, lifestyle, and family history variables. In a registry-based analysis, Morgan et al. (2011) reported a significantly higher risk for later-stage CRC among Hispanics compared with NHW in California, a difference that persisted regardless of anatomical location of the CRC in the bowel. Also using registry data, Hernandez et al. (2012) reported that not only have CRC incidence rates been higher among Florida Hispanics compared with NHW since mid-1990, but the incidence of later-stage distant CRC increased among Hispanics, while decreasing among NHW during the same time period. The same trend was observed for later-stage right-sided CRC, but not left-sided CRC, which may reflect the low rates of CRC screening among Hispanics in Florida (Hernandez et al., 2012). Although previous reports have demonstrated lower prevalence of CRC screening among Hispanics compared with NHW, screening rates were similarly low among both Hispanics and NHW participants in this study, indicating the role of additional risk factors in the population of this study.

Diabetes is an increasingly prevalent comorbidity in the United States. However, prevalence is markedly different between racial/ethnic groups. In 2011 through 2012, the estimated national prevalence among Hispanics (20.5%) was twice that among NHW (9.5%; Menke, Casagrande, Geiss, & Cowie, 2015). In the study population of this study, 1 in 4 of Hispanic participants had been diagnosed with diabetes or prediabetes, whereas the prevalence was 1 in 10 among NHW. The findings of this study identified nondiabetic Hispanic patients to be at higher risk for later-stage CRC than nondiabetic NHW patients. Diabetes is also an established risk factor for CRC with positive associations between CRC and insulin use (Rosato et al., 2016; Sun & Yu, 2012; Yuhara et al., 2011). The evidence for an association between type 2 diabetes and CRC risk is inconclusive with results differing by gender and anatomical location in the bowel (Acevedo et al., 2012; Díaz-Algorri et al., 2015; Rosato et al., 2016; Sun & Yu, 2012). Limited evidence suggests an association between prediabetes and gastrointestinal (stomach and colorectal) cancer (Huang et al., 2014).

A growing body of evidence is highly suggestive of a role for metformin therapy in the reduction of CRC incidence and mortality among patients with type 2 diabetes (Huang et al.,

2014; Rosato et al., 2016; Zhang et al., 2011). An estimated 70% of prediabetes patients convert to type 2 diabetes over time, and both type 2 diabetic and prediabetic patients receive dietary counseling and both may be treated with metformin (Nathan et al., 2007; Tabák, Herder, Rathmann, Brunner, & Kivimäki, 2012; Yudin & Montori, 2014). In fact, since 2008 the American Diabetes Association guidelines have recommended metformin treatment for prediabetic patients at high risk for diabetes (age younger than 60 years, BMI of 35 kg/m² or greater, and history of gestational diabetes; American Diabetes Association, 2014). However, Moin et al. (2015) reported metformin is infrequently prescribed to prediabetic patients nationally. Although information on medication usage among diabetic and prediabetic patients was not collected in this study, given the elevated prevalence of diabetes and prediabetes as risk factors among New Mexico Hispanics, therapeutic treatment and increased surveillance may be unmeasured factors underlying our observation of lower prevalence of late-stage CRC among the diabetic Hispanics in this study.

Increasing income, education, and other socioeconomic status indicators have been associated with decreased CRC risk across a range of racial/ethnic groups (Aarts, Lemmens, Louwman, Kunst, & Coebergh, 2010; Morgan et al., 2011; Mouw et al., 2008; Palmer & Schneider, 2005). An association between higher educational attainment and later-stage CRC among Hispanics was found in this study. Consistent with the finding of this study, Leufkens et al. (2012) reported higher educational attainment was associated with increased CRC risk in a European cohort, and Steinbrecher et al. (2012) reported higher socioeconomic status indicators were associated with elevated CRC incidence among Hispanics, but not among other racial/ethnic groups in a California cohort. The California study also found that living in more acculturated neighborhoods was also associated with CRC incidence among Hispanics. The authors hypothesized that Hispanics with higher socioeconomic indicators may have adopted more Westernized lifestyles of physical inactivity, obesity, and increased consumption of red meat and other behaviors that contribute to CRC risk.

Alcohol consumption is a consistent risk factor for CRC with significant variation in the magnitude of the observed effect dependent on the population, gender, and type or amount of alcohol consumed (American Diabetes Association, 2014; Fedirko et al., 2011; Moskal, Norat, Ferrari, & Riboli, 2007). The National Cancer Institute estimates a 40% increase in CRC for alcohol consumption exceeding 45 g/day or three standard alcoholic drinks as defined by the CDC (2017). Klarich, Brassier, and Hong (2015) reported an association between alcohol and increased CRC risk with intakes exceeding 30 g/day of alcohol. In two meta-analyses of alcohol and CRC risk, Fedirko et al. (2011) identified a significant association with consumption of >1 drink/day, and Wang, Duan, Yang, and Lin (2015) identified a dose-response relationship of increasing alcohol consumption and elevated CRC risk, in which alcohol was significant at all levels of consumption starting at 12.5 g/day. A large percentage of the study participants in this study reported no alcohol consumption in the year prior to their diagnosis, while among those who did drink alcohol, a significantly higher number of Hispanics reported heavy consumption. For Hispanics who reported consuming an average of five or more drinks per week (10 grams of alcohol daily) had a seven and a half times greater risk of late-stage CRC than NHW, after adjusting for gender, age, BMI, and family history. These results may be related to the type of alcohol, as well as

the actual amount consumed by the study population. Increased CRC risk has been observed with consumption of beer and spirits but a decreased risk has been associated with wine (Anderson et al., 2005; Klarich et al., 2015; Park et al., 2009).

In this study, the findings of higher late-stage CRC risk among Hispanic smokers is also consistent with other published results. Although not specific for race/ethnicity or CRC stage, current and previous smokers have been reported to have an increased risk of CRC in the distal colon and rectum (Leufkens et al., 2011; Liang, Chen, & Giovannucci, 2009). CRC risk may remain elevated as long as 25 years after smoking cessation (Gong et al., 2012).

Limitations

There are limitations to our study. The nonrandom sampling design of participants primarily recruited from oncology clinics limits the comparability of the sample to the general population of New Mexico. Information on diabetes medication were not collected, and both diabetic and prediabetic groups were combined in the analysis, reducing the ability to identify whether the inverse association between late and early CRC among diabetic and prediabetic Hispanics is related to medication use. CRC patients with aggressive, advanced stage disease may not have been represented in the “later-stage CRC” sample, since they may not have participated because they were undergoing treatment, too ill to participate, or had already died of the disease.

Although the current study cohort may be underpowered to detect small significant differences in a cross-sectional design, its sample size is sufficient for both aims of the current pilot study. Specifically, the number of events of interest (later-stage CRC) in our logistic regression models is 97, which is sufficient for modeling our primary outcome with up to 10 independent variables (Vittinghoff & McCulloch, 2006). The final sample size for this cross-sectional pilot study was 163 subjects. Even when shifting our interest to early-stage of CRC (66 events; see Table 2), the minimum sample size needed to achieve valid statistical modeling is about seven independent variables. The maximum number of independent variables used in the models of this study were six, which is less than what was recommended to avoid overfitting (Vittinghoff & McCulloch, 2006).

Conclusions

The impact of racial and ethnic disparities on later diagnostic CRC stages are complex and persistent. The magnitude of CRC disparity in stage of diagnosis may well increase as the Hispanic population in New Mexico and across the United States grows. The ethnicity-risk factor interactions reported in this study for later-stage CRC among Hispanics relative to NHW highlight smoking, alcohol consumption, and screening as potential targets for intervention strategies to reduce the burden of later-stage CRC among Hispanics. In addition, the potential modifying roles of diabetes, prediabetes, and associated medications on reduction of later-stage CRC risk warrants further exploration.

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Figure 1.

Recruitment of Hispanic ($n = 75$) and non-Hispanic White ($n = 88$) colorectal cancer patients, ages 30 to 75 years, from surgical and medical oncology clinics in Albuquerque, New Mexico (2013-2015), and identified through the New Mexico Tumor Registry for the same catchment area (2011-2014).

Table 1.

Distribution of Risk Factors Reported Between Hispanic and Non-Hispanic White Colorectal Cancer Patients.

	Hispanic (<i>n</i> = 75), <i>n</i> (%) ^a	Non-Hispanic White (<i>n</i> = 88), <i>n</i> (%) ^a	<i>p</i> value ^b
Gender			
Male	41 (54.7)	44 (50)	
Female	34 (45.3)	44 (50)	.55
Age at diagnosis			
<50 years	9 (12.0)	7 (8.0)	
50-64 years	49 (65.3)	54 (61.4)	
65 years and older	17 (22.7)	27 (30.7)	.42
Mean $\pm$ <i>SD</i> , years	57.5 $\pm$ 7.8	59.8 $\pm$ 7.4	.06
Education			
Less than high school	15 (20.0)	6 (6.8)	
High school	29 (38.7)	24 (27.3)	
More than high school	31 (41.3)	58 (65.9)	.003
Smoker			
Ever	48 (64.0)	53 (60.2)	
Never	27 (36.0)	35 (39.8)	.62
Alcohol use			
Nondrinker	47 (62.7)	41 (46.5)	
Light drinker	15 (20.0)	40 (45.5)	
Heavy drinker	13 (17.3)	7 (8.0)	.002
Body mass index ^c			
Normal	40 (53.3)	40 (45.5)	
Overweight	20 (26.7)	25 (28.4)	
Obese	15 (20.0)	23 (26.1)	.55
Diabetes ^d			
Yes	20 (26.7)	9 (10.2)	
No	55 (73.3)	79 (89.8)	.006
Family history of CRC			
Yes	11 (14.7)	8 (9.1)	
No	64 (85.3)	80 (90.9)	.27
CRC stage			
Early (I, II)	22 (29.3)	44 (50)	
Later (III, IV)	53 (70.7)	44 (50)	.007
Diagnosis method			
By screening	17 (25.8)	33 (40.7)	
By symptoms	49 (74.2)	48 (59.3)	.06
CRC screening ^e			
Current at diagnosis	10 (15.2)	28 (34.6)	

	Hispanic (<i>n</i> = 75), <i>n</i> (%) ^{<i>a</i>}	Non-Hispanic White (<i>n</i> = 88), <i>n</i> (%) ^{<i>a</i>}	<i>p</i> value ^{<i>b</i>}
Not current at diagnosis	56 (84.5)	53 (65.4)	.008

Note. CRC = colorectal cancer; BMI = body mass index; FOBT = fecal occult blood test.

^{*a*}Column percent.

^{*b*}*P* value corresponds to the chi-squared test for independence except for age in its continuous form where the *p* value corresponds to the two-samples independent *t* test.

^{*c*}Normal BMI < 24.9; overweight BMI 25-29.9; obese BMI ≥ 30.

^{*d*}Diabetic and prediabetic.

^{*e*}Patients age >50 years at CRC diagnosis, includes FOBT within the past year and/or colonoscopy within the past 10 years.

Table 2.

Distribution of Risk Factors Reported Within Hispanic and Non-Hispanic White Colorectal Cancer (CRC) Patients Contrasted by Early-Stage (I and II) and Late-Stage (III and IV) CRC.

	Hispanic		<i>p</i> value ^b	Non-Hispanic White		<i>p</i> value ^b
	Early (<i>n</i> = 22), <i>n</i> (%) ^a	Late (<i>n</i> = 53), <i>n</i> (%)		Early (<i>n</i> = 44), <i>n</i> (%)	Late (<i>n</i> = 44), <i>n</i> (%)	
Gender			.60			.67
Male	11 (26.8)	30 (73.2)		21 (47.7)	23 (52.3)	
Female	11 (32.4)	23 (67.7)		23 (52.3)	21 (47.7)	
Age at diagnosis			.19			.02
<50 years	2 (22.2)	7 (77.8)		0 (0)	7 (100)	
50-64 years	12 (24.5)	37 (77.5)		29 (53.7)	25 (46.3)	
65 years and older	8 (47.1)	9 (52.9)		15 (55.6)	12 (44.4)	
Mean ± <i>SD</i> , years	59.0 ± 8.5	57.0 ± 7.5	.32	61.5 ± 6.1	58.2 ± 8.2	.04
Education			.46			.89
Less than high school	6 (40.0)	9 (60.0)		3 (50.0)	3 (50.0)	
High school	9 (31.0)	20 (67.0)		11 (45.8)	13 (54.2)	
More than high school	7 (22.6)	24 (77.4)		30 (51.7)	28 (48.3)	
Smoker			.27			.51
Ever	12 (25.0)	36 (75.0)		25 (47.2)	28 (52.8)	
Never	10 (37.0)	17 (63.0)		19 (54.3)	16 (45.7)	
Alcohol use			.41			.24
Nondrinker	16 (34.0)	31 (66.0)		24 (58.5)	17 (41.5)	
Light drinker	4 (26.7)	11 (73.3)		18 (45.0)	22 (55.0)	
Heavy drinker	2 (15.4)	11 (84.6)		2 (28.6)	5 (71.4)	
Body mass index ^c			.91			.91
Normal	11 (27.5)	29 (72.5)		19 (47.5)	21 (52.5)	
Overweight	6 (30.0)	14 (70.0)		13 (52.0)	12 (48.0)	
Obese	5 (33.3)	10 (66.7)		12 (52.2)	11 (47.8)	
Diabetes ^d			.018			.73
Yes	10 (50.0)	10 (50.0)		5 (55.6)	4 (44.4)	
No	12 (21.8)	43 (78.2)		39 (49.4)	41 (50.6)	
CRC family history			.58			1.00
Yes	4 (36.4)	7 (63.6)		4 (50.0)	4 (50.0)	
No	18 (28.1)	46 (71.9)		40 (50.0)	40 (50.0)	
Diagnosis method			.26			.35
By screening	7 (35.0)	13 (65.0)		20 (60.6)	13 (39.4)	
By symptoms	10 (21.7)	36 (78.3)		24 (50.0)	24 (50.0)	
CRC screening ^e			.44			.92
Current at diagnosis	2 (20.0)	8 (80.0)		15 (53.6)	13 (46.4)	
Not current at diagnosis	18 (32.1)	38 (67.9)		29 (54.7)	24 (45.3)	

Note. CRC = colorectal cancer; BMI = body mass index; FOBT = fecal occult blood test.

^aRow percent.

^b*P* value corresponds to the chi-squared test for independence except for age in its continuous form where the *p* value corresponds to the two-samples independent *t* test.

^cNormal BMI < 24.9; overweight BMI 25-29.9; obese BMI ≥ 30.

^dDiabetic and prediabetic.

^ePatients age ≥ 50 years at CRC diagnosis, includes FOBT within the past year and/or colonoscopy within the past 10 years.

Table 3.

Odds Ratios for Late-Stage CRC Diagnosis for All Patients.

		Baseline, Adjusted OR (CI) ^a	Model Goodness of Fit ^b	Baseline Plus CRC Screening, Adjusted OR (CI) ^c	Model Goodness of Fit ^b
<i>Model 1: Education</i>					
Less than high school	White	1.00		1.00	
	Hispanic	1.51 (0.56-4.06)		1.56 (0.57-4.26)	
High school graduate or higher	White	1.00		1.00	
	Hispanic	3.51 (1.28-9.65)		3.54(1.29-9.75)	
			$\chi^2 = 4.87; p = .77$		$\chi^2 = 7.91; p = .44$
<i>Model 2: Drinks per Week^d</i>					
Less than five	White	1.00		1.00	
	Hispanic	1.72 (0.82-3.62)		1.78 (0.84-3.79)	
Five or more	White	1.0		1.00	
	Hispanic	7.59 (1.31-43.92)		7.86 (1.35-45.73)	
			$\chi^2 = 7.33; p = .50$		$\chi^2 = 7.74; p = .46$
<i>Model 3: Diabetes</i>					
Nondiabetic	White	1.00		1.00	
	Hispanic	3.23 (1.46-7.15)		3.32 (1.48-7.41)	
Diabetic	White	1.00		1.00	
	Hispanic	1.01 (0.20-5.08)		1.07 (0.21-5.46)	
			$\chi^2 = 2.74; p = .95$		$\chi^2 = 3.16; p = .92$
<i>Model 4: Smoking</i>					
Never	White	1.00		1.00	
	Hispanic	1.87 (0.64-5.41)		1.92 (0.66-5.59)	
Ever	White	1.00		1.00	
	Hispanic	2.47 (1.03-5.89)		2.62 (1.08-6.34)	
			$\chi^2 = 6.19; p = .63$		$\chi^2 = 3.19; p = .92$

Note. CRC = colorectal cancer; OR = odds ratio; CI = confidence interval; BMI = body mass index.

^aAdjusted for sex and age at diagnosis, BMI status, and family history of CRC.^bHosmer and Lemeshow goodness of fit, $df = 8$ for all models.^cAdjusted for sex and age at diagnosis, BMI status, family history of CRC, and up-to-date CRC screening.^dMean number of alcoholic drinks per week consumed during the year prior to CRC diagnosis.