

## Observational Study

## Race and colorectal cancer screening compliance among persons with a family history of cancer

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### Abstract

**AIM:** To determine compliance to colorectal cancer (CRC) screening guidelines among persons with a family history of any type of cancer and investigate racial differences in screening compliance.

**METHODS:** We used the 2007 Health Information National Trends Survey and identified 1094 (27.4%)

respondents (weighted population size = 21959672) without a family history of cancer and 3138 (72.6%) respondents (weighted population size = 58201479) with a family history of cancer who were 50 years and older. We defined compliance with CRC screening as the use of fecal occult blood testing within 1 year, sigmoidoscopy within 5 years, or colonoscopy within 10 years. We compared compliance with CRC screening among those with and without a family member with a history of cancer.

**RESULTS:** Overall, those with a family member with cancer were more likely to be compliant with CRC screening (64.9% *vs* 55.1%; OR = 1.45; 95%CI: 1.20-1.74). The absolute increase in screening rates associated with family history of cancer was 8.2% among whites. Hispanics had lowest screening rates among those without family history of cancer 41.9% but had highest absolute increase (14.7%) in CRC screening rate when they have a family member with cancer. Blacks had the lowest absolute increase in CRC screening (5.3%) when a family member has a known history of cancer. However, the noted increase in screening rates among blacks and Hispanics when they have a family member with cancer were not higher than whites without a family history of cancer: (54.5% *vs* 58.7%; OR = 1.16; 95%CI: 0.72-1.88) for blacks and (56.7% *vs* 58.7%; OR = 1.25; 95%CI: 0.72-2.18) for Hispanics.

**CONCLUSION:** While adults with a family history of any cancer were more likely to be compliant with CRC screening guidelines irrespective of race/ethnicity, blacks and Hispanics with a family history of cancer were less likely to be compliant than whites without a family history. Increased burden from CRC among blacks may be related to poor uptake of screening among high-risk groups.

**Key words:** Colon cancer; Health disparities; Screening; Fecal blood test; Colonoscopy

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**Core tip:** It is unclear whether suboptimal screening contributes to the increased risk of cancer within families. We evaluated compliance with colon cancer screening guidelines among adults in the United States. Our study suggested that adults with a family history of any cancer had higher screening rates, but the smallest increase was noted among blacks. Overall, screening was lower among blacks and Hispanics to such an extent that screening among those with a family member with cancer was not higher than screening among whites without a family member with cancer. There is a particular need to improve screening among high risk blacks.

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## INTRODUCTION

Colorectal cancer (CRC) is a leading cause of cancer-related deaths in the United States<sup>[1]</sup>. There is ample evidence that screening reduces the burden from this deadly but largely preventable disease<sup>[2-4]</sup>. Unfortunately, screening rates are suboptimal among the population, particularly among racial/ethnic minorities.

A primary driving factor for the time to initiate CRC screening is the family history of CRC<sup>[5]</sup>. However, it is well known that malignancies of other organ sites are associated with syndromic CRC such as Lynch syndrome (hereditary non-polyposis colorectal cancer)<sup>[6,7]</sup>. Lynch syndrome is caused by mutations in mismatch repair gene and is associated with an increased the risk of CRC but other malignancies such as endometrial and urogenital cancers are associated with this syndrome as well.

We hypothesized that CRC awareness should be higher among families with any history of cancer, not just CRC. This awareness should in turn be associated with uptake of CRC screening. The burden of CRC is highest among blacks due to multiple factors related to poorer access, inadequate utilization of healthcare resources even when available and possible biological susceptibility differences<sup>[8-10]</sup>. Furthermore, blacks are less likely to be aware of cancer diagnosis of their family members<sup>[11,12]</sup>. We postulated that increased CRC incidence and mortality among blacks may be due to poorer uptake of CRC screening among those at a higher risk of the disease. The aim of the present study was to evaluate compliance with CRC screening guidelines among United States adults with and without a family member with any cancer and investigate differences in compliance by race/ethnicity (whites, blacks and Hispanics).

## MATERIALS AND METHODS

We used data from the 2007 Health Information National Trends Survey (HINTS) and the details of the survey have been published<sup>[13]</sup>. In summary, HINTS was a national survey of adults on health-related information and practices. It was conducted by the National Cancer Institute, National Institutes of Health in the United States between January 2008 and May 2008. The survey is available online at [http://hints.cancer.gov/docs/Instruments/HINTS%202007%20CATI%20Instrument%20\(English\).pdf](http://hints.cancer.gov/docs/Instruments/HINTS%202007%20CATI%20Instrument%20(English).pdf) and <http://hints.cancer.gov/docs/HINTS2007FinalReport.pdf>.

A total of 7674 people completed the HINTS telephone interview ( $n = 4092$ ), or mailed survey ( $n = 3582$ ). Respondents were asked to provide information

**Table 1 Comparison of characteristics of respondents with and without a family history of cancer**

Characteristics	Family history of cancer		P value
	No n = 1094 (27.4%)	Yes n = 3138 (72.6%)	
Mean age, yr (95%CI)	63.4 (62.7-64.2)	63.8 (63.5-64.1)	
Sex, n (%)			< 0.001
Male	520 (55.8)	1158 (42.5)	
Female	574 (44.2)	1980 (57.5)	
Race, n (%)			< 0.001
White	818 (70.4)	2560 (82.1)	
Black	107 (12.6)	244 (9.6)	
Hispanic	92 (10.0)	134 (5.2)	
Other	62 (6.9)	123 (3.1)	
Education status, n (%)			0.03
Less than high school	139 (19.6)	287 (14.6)	
High school	287 (25.2)	857 (28.6)	
Some college/vocation	297 (31.1)	933 (31.7)	
College graduate	365 (24.1)	1050 (25.2)	
Marital status, n (%)			0.01
Unmarried	406 (32.1)	1300 (37.2)	
Married	684 (67.9)	1822 (62.8)	
Insurance status, n (%)			0.001
Uninsured	100 (12.1)	201 (7.3)	
Insured	983 (87.9)	2886 (92.7)	
Smoking status, n (%)			0.31
Never	499 (44.7)	1472 (46.2)	
Former	400 (37.4)	1205 (38.7)	
Current	179 (18.0)	419 (15.1)	
Body mass index in kg/m <sup>2</sup>			0.82
< 25	363 (31.7)	1047 (31.7)	
25-29	406 (39.0)	1160 (37.8)	
≥ 30	316 (29.3)	905 (30.5)	
Personal history of cancer, n (%)			0.06
No	908 (87.8)	2536 (85.3)	
Yes	185 (12.2)	592 (14.7)	

All percentages are weighted.

on demographic and lifestyle factors, first degree family history of any type of cancer. They were also asked about colon cancer screening with fecal occult blood test, sigmoidoscopy or colonoscopy and when they had the tests. After obtaining approval (IRB-14-MED-28) from the Institutional Review Board of Howard University in Washington DC, we downloaded the dataset. For the present study, our analytical cohort consisted of 4232 respondents (weighted population size = 80161151) who were at least 50 years old and answered questions about their family history of cancer and CRC screening compliance.

### Statistical analysis

Our primary outcome was the compliance to CRC screening guidelines defined as the uptake of fecal occult blood testing within 1 year, sigmoidoscopy within 5 years, or colonoscopy within 10 years. We compared the characteristics of respondents with and without family members with a history of cancer. We used survey weights in all analyses and Taylor series linearization was used for variance estimations. Logistic regression analysis was used to estimate OR and 95%CI for the association between family history of cancer and compliance

with CRC screening guidelines. We also investigated this association by race/ethnicity. Our final models included age, sex, marital status, highest education achieved, race, health insurance status, smoking status and personal history of cancer. We calculated OR and 95%CI. Statistical analysis was performed by a qualified biostatistician using Stata® statistical software version 11.2 (College Station, Texas) for all analyses. All reported percentages were weighted.

## RESULTS

The comparisons of the characteristics of respondents with and without a family history of any cancer are shown in Table 1. Overall, those with a family history were more likely to be female, unmarried, and have health insurance. However, there was no difference in the prevalence of cigarette smoking, body mass index, or personal history of cancer.

When compared to respondents without a family history of cancer, those who had family members with cancer were more likely to be compliant with CRC screening (64.9% vs 55.1%; OR = 1.45; 95%CI: 1.20-1.74). Among whites, those with family history of

**Table 2** Intra-racial comparison of being up-to-date with colorectal cancer screening by racial distribution of family history of any cancer

	Family history of any cancer	Up-to-date with CRC screening		
		Wt % screened	Unadjusted OR (95%CI)	Adjusted OR (95%CI)
Overall	No ( <i>n</i> = 1094)	55.1	Reference	Reference
	Yes ( <i>n</i> = 3138)	64.9	1.51 (1.25-1.81)	1.45 (1.20-1.74)
By race				
White	No ( <i>n</i> = 818)	58.7	Reference	Reference
White	Yes ( <i>n</i> = 2560)	66.9	1.42 (1.18-1.72)	1.49 (1.24-1.78)
Black	No ( <i>n</i> = 107)	49.2	Reference	Reference
Black	Yes ( <i>n</i> = 244)	54.5	1.24 (0.64-2.38)	1.34 (0.61-2.94)
Hispanic	No ( <i>n</i> = 92)	41.9	Reference	Reference
Hispanic	Yes ( <i>n</i> = 134)	56.7	1.81 (0.84-3.89)	1.42 (0.55-3.67)

Adjusted for age, sex, education, health insurance, BMI, smoking, marital status and personal history of cancer. CRC: Colorectal cancer; BMI: Body mass index.

**Table 3** Inter-racial comparison of being up-to-date with colorectal cancer screening by racial distribution of family history of any cancer

Race	Family history of any cancer	Up-to-date with CRC screening		
		Wt % screened	Unadjusted OR (95%CI)	Adjusted OR (95%CI)
White	No ( <i>n</i> = 818)	58.7	Reference	Reference
White	Yes ( <i>n</i> = 2560)	66.9	1.42 (1.18-1.72)	1.45 (1.21-1.74)
Black	No ( <i>n</i> = 107)	49.2	0.68 (0.39-1.18)	0.96 (0.51-1.80)
Black	Yes ( <i>n</i> = 244)	54.5	0.84 (0.54-1.31)	1.16 (0.71-1.90)
Hispanic	No ( <i>n</i> = 92)	41.9	0.51 (0.27-0.95)	0.84 (0.48-1.47)
Hispanic	Yes ( <i>n</i> = 134)	56.7	0.92 (0.57-1.48)	1.25 (0.72-2.18)

Adjusted for age, sex, education, health insurance, BMI, smoking, marital status and personal history of cancer. CRC: Colorectal cancer; BMI: Body mass index.

cancer had 8.2% absolute higher screening rates than whites without family history of cancer (OR = 1.45; 95%CI: 1.20-1.75; Table 2). Screening rates were generally lower among Hispanics and blacks. Blacks had the lowest increase in screening rates (5.3%) when a family member had a history of cancer which was not statistically different from blacks without a family member with cancer diagnosis (OR = 1.34; 95%CI: 0.61-2.94). Although, Hispanics had the lowest screening rates among those without history of cancer (41.9%), the absolute increase in screening rates was highest among Hispanics (14.7%) when a family member has had a history of cancer.

Despite increase in CRC screening rates among blacks and Hispanics with family history of cancer, their screening rates were still numerically lower than the screening rates among whites without a family history of cancer. However, there were no statistically significant differences in the comparison of interracial screening rates (Table 3).

## DISCUSSION

In the present study, we evaluated compliance with CRC screening guidelines among United States adults with and without a family history of cancer overall and by race/ethnicity. Irrespective of race/ethnicity, we found that those with a family history of cancer were more

likely to be compliant with CRC screening guidelines compared to those without a family history. This pattern was present among each racial/ethnic group. However, this relationship was statistically significant only among whites. Among blacks, the absolute increase in the compliance with CRC screening among those with a family history of cancer was small. We found that screening rates were so low among blacks that the higher screening rates observed among blacks with family history of cancer were still numerically lower albeit not statistically different from the screening rate among whites without a family history of cancer. This suggests that the increased CRC burden among blacks may be, in part, due to low screening rates among high risk blacks and underscores the need to increase awareness and screening rates among blacks.

Although the Hispanics in this study have the lowest CRC screening rates among those without a family history of cancer, they exhibited the highest absolute increase in CRC screening among those with a family history of cancer. This suggests an appropriate response in uptake of preventive services among Hispanics, but the screening rates were still lower than that among whites without a family history of cancer. This finding indicates that increased education about CRC screening is needed among Hispanics.

We are not aware of any other study that has examined the association of a family history of any

cancer with CRC screening for a direct comparison to our study. However, prior studies have examined the CRC screening among persons with a family history of CRC. Using data from the 2005 California Health Interview Survey (CHIS), Ponce *et al.*<sup>[14]</sup> reported that screening rates were lower among Hispanics in general when compared with whites, but disparities were more pronounced among respondents with a family history of CRC (OR = 0.28; 95%CI: 0.11-0.60) as compared to disparity among those without family history of CRC (OR = 0.74; 95%CI: 0.59-0.92). However, CRC screening rate was comparable among blacks and whites among those with (OR = 0.92; 95%CI: 0.31-1.34) or without a family history of CRC (OR = 1.08; 95%CI: 0.84-1.40). In another study which used the 2009 CHIS, Almario *et al.*<sup>[15]</sup> investigated CRC screening among respondents with a family history of CRC in California. The authors reported that there was no difference in overall screening rate among blacks when compared to whites (OR = 1.03; 95%CI: 0.81-1.27). However, among individuals who were 40-49 years old (when early screening should have started because of the increased risk of CRC), blacks were 71% less likely to have had a colonoscopy (OR = 0.29; 95%CI: 0.04-0.87). Taken together, these two studies suggest lower rates of appropriate CRC screening among blacks and Hispanics at an increased risk of CRC. However, the studies focused only on residents of the state of California. Nonetheless, these findings were comparable to our findings that are based on nationally representative data of United States adults.

It is unclear why the rates of CRC screening was lower among these minority populations, but we speculate that known factors such as health literacy, access and utilization differences may be playing important roles. In a previous study using the 2007 HINTS data, Orom *et al.*<sup>[16]</sup> reported differences in perceived cancer risk by race. The authors reported that Hispanics were less likely to perceive themselves at higher risk of cancer even when they have family members with cancer. This disconnect may be related to health literacy or communication challenges. It is well known that blacks are less likely to discuss their chronic health problems with family members<sup>[17,18]</sup> and often hold fatalistic beliefs which negatively correlate with uptake of preventive services such as CRC screening<sup>[19]</sup>.

There are some notable strengths of our study. We examined compliance with CRC screening guidelines among a nationally representative large sample of United States adults and two modes of survey was used (mail and telephone), thereby increasing the reach of the survey. Furthermore, the survey was conducted in English and Spanish to ensure broader participation. However, our study has important limitations. Although we do not suspect that respondents would have any motivation not to tell the truth, but our study was based on self reports and we could not abstract medical records to verify CRC screening uptake and the time they took place. Also, the race designation in the HINTS survey was by self-identification. Furthermore, our

study did not capture other factors which may influence CRC screening compliance such as accessibility to healthcare facilities, availability of culturally sensitive care providers and type of health insurance coverage.

In conclusion, while being up-to-date with CRC screening is generally higher among those with a family history of cancer, blacks and Hispanics with a family history of cancer were less likely to be compliant with CRC screening guidelines compared with whites without a family history of cancer. There is a need to improve cancer education among blacks and Hispanics and increase CRC screening rates, especially among higher risk groups.

## COMMENTS

### Background

The risk of cancer is higher among families when a member has been diagnosed with cancer. The current study evaluated compliance with colorectal cancer (CRC) screening guidelines among adults with and without a family member with a history of cancer.

### Research frontiers

The CRC screening rates were higher among United States adults with family members with cancer diagnosis. By race, CRC screening rates among blacks and Hispanics were lower than whites. The screening rates among blacks and Hispanics with family history of cancer did not even reach the level of screening among whites without family history of cancer.

### Innovations and breakthroughs

The current study examined whether United States adults with a family history of cancer were more likely to be compliant with CRC screening guidelines. This has not been thoroughly investigated previously.

### Applications

Blacks and Hispanics have lower screening rates than whites even when they have family members with history of cancer. This study suggests that the low absolute increase in CRC screening rates among blacks when a family member has a history of cancer may represent inadequate CRC screening uptake among high risk blacks. This may be playing a role in the observed CRC disparity by race in the United States.

### Terminology

Screening for CRC reduces the incidence and mortality from the disease.

### Peer-review

The manuscript is a well-designed observational study that addressed a major issue about health behavior among different races. The authors managed to reveal this issue through extensive research and thorough statistical analysis.

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