Colonoscopy Screening in African Americans and Whites With Affected First-Degree Relatives

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Background: Family history is a risk factor for colon cancer, and guidelines recommend initiating screening at age 40 years in individuals with affected relatives. Racial differences in colon cancer mortality could be related to variations in screening of increased-risk individuals.

Methods: Baseline data from 41 830 participants in the Southern Community Cohort Study were analyzed to determine the proportion of colonoscopy procedures in individuals with strong family histories of colon cancer, and whether differences existed based on race.

Results: In participants with multiple affected first-degree relatives (FDRs) or relatives diagnosed before age 50 years, 27.3% (95% confidence interval [CI], 23.5%-31.1%) of African Americans reported having a colonoscopy within the past 5 years compared with 43.1% (95% CI, 37.0%-49.2%) of white participants ($P<.001$). African Americans in this group had an odds ratio of 0.51 (95% CI, 0.38-0.68) of having undergone recommended screening procedures compared with white participants after adjusting for age, sex, educational status, annual income, insurance status, total number of affected and unaffected FDRs, and time since last medical visit. African Americans with multiple affected FDRs or relatives diagnosed before age 50 years and who had ever undergone endoscopy were less likely to report a personal history of colon polyps (odds ratio, 0.29; 95% CI, 0.20-0.42) when compared with whites with similar family histories.

Conclusions: African Americans who have FDRs with colon cancer are less likely to undergo colonoscopy screening compared with whites who have affected relatives. Increased efforts need to be directed at identifying and managing underserved populations at increased risk for colon cancer based on their family histories.

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FAMILY HISTORY IS AN IMPORTANT risk factor for colorectal cancer (CRC), and risk increases as the burden of disease within a family increases.[1] For individuals with a first-degree relative (FDR) diagnosed as having colon cancer before age 60 years, or who have multiple FDRs affected, the cumulative risk of CRC is sufficiently increased to warrant aggressive screening.[2] Subsequently, most clinical guidelines have recommended initiating CRC screening at age 40 years, as opposed to age 50 years, which is the recommended age to begin screening in average-risk individuals.[3,4] In addition, for increased-risk patients without a hereditary CRC syndrome, colonoscopy, performed every 5 years, is the screening modality of choice.

Despite effective interventions for CRC prevention, colon cancer is associated with significant differences in mortality among ethnic groups.[5,6] For example, African Americans have a higher incidence of and mortality associated with CRC when compared with whites. It is possible that factors associated with the delivery of cancer prevention services may contribute to these differences. Several studies have evaluated differences in CRC screening rates between average-risk African Americans and whites. Although some studies have identified significant differences, many have found similar screening rates after adjusting for socioeconomic factors.[7-11] Nevertheless, it remains unclear whether CRC screening differences might exist among individuals at increased risk for colon cancer, such as those with a family history of the disease.

Because a family history of CRC is associated with increased risk, even small screening inequities in individuals with affected relatives could translate into large differences in cancer outcomes.[6] The purpose of this study was to examine the use of colonoscopy procedures in increased-risk individuals, and to determine whether differences exist based on race.

METHODS

STUDY POPULATION

The Southern Community Cohort Study (SCCS) is an ongoing prospective observational study investigating cancer incidence and mortality disparities across racial and urban/rural groups in a population of participants enrolled at community health centers and through

Table 1. Baseline Demographic Characteristics by Race[a]

Characteristic	African American (n=32 265)	White (n=9565)	*P* Value
Age, mean (SD), y	50.6 (8.4)	52.6 (9.2)	<.001
Female sex	19 106 (59.2)	6458 (67.5)	<.001
Annual income ≥$15 000	12 297 (38.5)	3949 (41.7)	<.001
Education beyond high school	8829 (27.4)	2922 (30.6)	<.001
Insurance status			.42
Any private insurance	6957 (21.6)	2042 (21.4)	
Medicaid, Medicare, CHAMPUS/Tricare, or other	11 279 (35.0)	3294 (34.5)	
None	13 985 (43.4)	4219 (44.2)	
Body mass index,[b] mean (SD)	30.3 (7.5)	30.1 (7.7)	.03
Current smoking status	14 541 (45.1)	4166 (43.6)	.009
≥2 Alcoholic drinks per day	6033 (18.8)	929 (9.8)	<.001
Physical activity level, mean (SD), MET h/d	23.4 (19.5)	21.2 (18.4)	<.001
Personal history of colon cancer	68 (0.2)	49 (0.5)	<.001
Age at diagnosis, mean (SD), y	47.3 (12.1)	51.9 (11.2)	.04
Personal history of colorectal polyps	1170 (3.6)	1033 (10.8)	<.001
Age at diagnosis, mean (SD), y	49.3 (12.1)	49.1 (12.6)	.69
Total No. of FDRs, mean (SD)	7.1 (3.8)	5.5 (2.7)	<.001
Family history			<.001
≥2 FDRs diagnosed at any age or 1 FDR diagnosed at age <50 y	538 (1.7)	255 (2.7)	
1 FDR diagnosed at age ≥50 y	1294 (4.0)	504 (5.3)	
Regular use of aspirin[c]	3771 (11.7)	1483 (15.5)	<.001
Daily use of calcium	2102 (6.5)	1328 (13.9)	<.001
Daily use of folic acid	991 (3.1)	472 (5.0)	<.001
Time since last health care provider visit, mean (SD), mo	7.3 (22.3)	6.2 (20.6)	<.001

Abbreviations: CHAMPUS, Civilian Health and Medical Program of the Uniformed Services; FDR, first-degree relative; MET, metabolic equivalent tasks.

[a] Data are given as number (percentage) of participants unless otherwise indicated.

[b] Calculated as weight in kilograms divided by height in meters squared.

[c] Regular use defined as at least 2 times per week for 1 month or more.

general-population sampling (via the mail) in a 12-state region throughout the southeast.[12] Included within this cross-sectional analysis are participants enrolled from 48 community health centers from March 2002 through September 2006. Potential study subjects were approached by a trained interviewer and were informed of the study. Participants were eligible if they were aged 40 to 79 years, English speaking, and had not undergone treatment for any cancer (except nonmelanoma skin cancer) during the preceding 12 months. The SCCS has been approved by the Vanderbilt University Medical Center and Meharry Medical College institutional review boards.

Of 51 454 SCCS participants, we excluded 2546 individuals who were self-identified as a race other than African American or white. These participants were excluded due to a lack of power to perform the study in other racial groups. We also excluded 469 participants whose sigmoidoscopy and colonoscopy use could not be determined and 6609 participants who could not be classified with certainty according to family history of colon cancer, leaving us with 41 830 participants. Baseline data were collected for demographic characteristics, family cancer history, tobacco and alcohol use, prior medical history, physical activity level, and use of prescription medications.

FAMILY HISTORY AND ENDOSCOPY ASSESSMENT

Family history information was collected for FDRs exclusively. Individuals reporting an FDR with colon cancer were asked (1) the number of affected relatives and (2) if the diagnosis occurred before the affected relative's 50th birthday. Because of possible etiological differences between colon and rectal cancers, we only included individuals reporting a family history of colon cancer. Participants were then divided into 3 groups based on their self-reported family history. These groups were based on risk categories proposed by the American Gastroenterology Association (AGA)[4] which included (1) multiple affected FDRs or an FDR diagnosed before age 60 years; (2) a single FDR diagnosed at age 60 years or later; and (3) no family history. Because the SCCS only recorded age at cancer diagnosis as a dichotomous variable (<50 years vs ≥50 years), we modified these criteria to use age 50 years as our indicator of increased familial risk rather than the AGA-specified age of 60 years.

Participants were asked questions about their past use of sigmoidoscopy and colonoscopy procedures. A sigmoidoscopy was described as "[a] short tube inserted into the rectum while you are awake and un-sedated to look for colon or rectal cancer" and a colonoscopy was described as "[a] long tube inserted into the rectum after you are sedated or put to sleep to look for colon or rectal cancer." We compared the proportion of individuals reporting a colonoscopy procedure within the past 5 years among different family history categories. For our primary analysis, we used the most conservative screening recommendation, with colonoscopy procedures beginning at age 40 years and repeated every 5 years. We repeated our analysis using the less stringent recommendations suggested for individuals with a single FDR affected at age 60 years or later and compared the proportion of participants who reported either a colonoscopy within the past 10 years or a flexible sigmoidoscopy within the prior 5 years.[4] The baseline survey did not inquire about the use of fecal occult blood testing and barium enema.

STATISTICAL ANALYSIS

For descriptive univariate analyses, continuous variables were compared using analysis of variance. Categorical data were analyzed using the χ^2 test. To determine the effect of race on colonoscopy procedure rates, we constructed logistic regression models adjusted for age (continuous), sex (male vs female), educational status (high school or less vs beyond high school), insurance status (any private, only public/other, or none), annual income level (<$15 000 vs ≥$15 000), total number of FDRs reported (continuous), and time (in months) since last visit to a physician or other health care professional. The models were then stratified based on family history. We constructed logistic regression models to determine the association of race with self-reported personal history of colon or rectal polyps stratified by family history. In this model, we adjusted for age, sex, educational status, total number of FDRs, body mass index (calculated as weight in kilograms divided by height in meters squared) (continuous), current tobacco use (yes vs no), alcohol use (≥2 drinks per day vs <2 drinks per day), physical activity level (defined as the estimated total metabolic equivalent in task hours per day from work) and sports activities (continuous), daily calcium supplement use (yes vs no), daily folate supplement use (yes vs no), regular use of aspirin (yes vs no), and time since last visit to a physician or other health care professional. Because of the possibility of intra–health center correlations regarding colon cancer screening practices, we constructed generalized estimating equations to adjust for any clustering by community health center. All analyses had a 2-sided α level of .05. All analyses were conducted using SAS statistical software, version 9.1 (SAS Institute Inc, Cary, North Carolina).

RESULTS

BASELINE CHARACTERISTICS

Baseline characteristics are presented in **Table 1**. African American participants were younger than white par-

Table 2. History of Colonoscopy or Sigmoidoscopy by Family History of Colon Cancer[a]

	<50 y			≥50 y		
	African American	White	*P* Value	African American	White	*P* Value
Colonoscopy in past 5 y						
>1 FDR or 1 FDR diagnosed at age <50 y	58 (21.0)	36 (34.0)	.009	88 (34.0)	73 (49.7)	.002
1 FDR diagnosed at age ≥50 y	75 (13.5)	41 (24.6)	.007	239 (32.5)	136 (40.5)	.01
No FDR	1289 (7.9)	492 (12.4)	<.001	3102 (22.1)	1445 (30.1)	<.001
Colonoscopy in past 10 y						
>1 FDR or 1 FDR diagnosed at age <50 y	67 (24.3)	46 (43.4)	.002	93 (35.9)	84 (57.1)	<.001
1 FDR diagnosed at age ≥50 y	78 (14.1)	46 (27.5)	<.001	259 (35.2)	152 (45.2)	.002
No FDR	1438 (8.8)	587 (14.8)	<.001	3338 (23.8)	1632 (34.0)	<.001
Flexible sigmoidoscopy in past 5 y						
>1 FDR or 1 FDR diagnosed at age <50 y	31 (11.2)	10 (9.4)	.60	44 (16.9)	25 (17.2)	.93
1 FDR diagnosed at age ≥50 y	50 (9.0)	14 (8.4)	.82	115 (15.7)	51 (15.2)	.85
No FDR	996 (6.1)	225 (5.7)	.29	2041 (14.6)	587 (12.2)	<.001

Abbreviation: FDR, first-degree relative.
[a]Data are given as number (percentage) of participants unless otherwise indicated.

ticipants), were less likely to have been educated beyond high school, and were less likely to have an annual household income of $15 000 or greater when compared with white participants. Five hundred thirty-eight African American respondents (1.7%) reported multiple affected FDRs or an FDR diagnosed before age 50 years compared with 255 white respondents (2.7%) ($P<.001$). Similarly, African Americans were less likely to report a single affected relative diagnosed at or after age 50 years.

MULTIPLE FDRs OR SINGLE RELATIVE DIAGNOSED BEFORE AGE 50 YEARS

Among participants aged 40 to 49 years, 21.0% of African Americans reported undergoing a colonoscopy within the past 5 years compared with 34.0% of whites ($P=.009$) (**Table 2**). In this same age group, 11.2% of African Americans reported undergoing a flexible sigmoidoscopy within the past 5 years compared with 9.4% of whites ($P=.60$). African Americans had an adjusted odds ratio of 0.52 (0.32-0.84) when compared with whites for reporting having undergone a colonoscopy within the past 5 years (**Table 3**).

Among participants 50 years or older, African Americans with a strong family history of colon cancer were less likely to report having undergone colonoscopy screening within the past 5 years compared with whites with similar family histories (34.0% vs 49.7%, $P=.002$). There was no difference in reported rates of flexible sigmoidoscopy procedures between these 2 groups (16.9% vs 17.2%, $P=.93$). African Americans 50 years or older had an adjusted odds ratio of 0.50 when compared with whites for reporting having undergone a colonoscopy within the past 5 years (Table 3).

SINGLE FDR DIAGNOSED AT 50 YEARS OR OLDER

Among participants aged 40 to 49 years, 13.5% of African Americans reported having undergone a colonoscopy in the past 5 years compared with 24.6% of white respondents ($P=.007$). There was no difference in the reported rate of flexible sigmoidoscopy procedures between African Americans and whites (9.0% vs 8.4%, $P=.82$). African Americans had an adjusted odds ratio of 0.41 for having completed a colonoscopy procedure in the past 5 years when compared with whites (Table 3).

Among participants 50 years or older, 32.5% of African Americans vs 40.5% of whites reported having a colonoscopy in the past 5 years ($P=.01$). Rates of flexible sigmoidoscopy were similar between African Americans and whites in both age groups (15.7% vs 15.2%, $P=.85$).

PERSONAL HISTORY OF COLON OR RECTAL POLYPS

We investigated the relationship between family history of colon cancer and colorectal polyp diagnoses in all participants who reported having a prior colonoscopy or flexible sigmoidoscopy. African Americans with multiple affected FDRs or a single FDR diagnosed as having colon cancer before age 50 years were less likely to report a personal diagnosis of colorectal polyps when compared with white respondents with similar family histories (19.7% vs 46.9%, $P<.001$). After multivariate adjustment, African Americans with strong family histories of colon cancer had an odds ratio of 0.29 for reporting a personal diagnosis of colorectal polyps when compared with whites (**Table 4**).

In participants reporting a single affected relative diagnosed at 50 years or older, African Americans were also less likely to report a personal diagnosis of colorectal polyps when compared with whites (21.3% vs 40.4%, $P<.001$). African Americans had an adjusted odds ratio of 0.40 of reporting a personal diagnosis of colorectal polyps when compared with whites (Table 4).

REPORTED REASONS FOR NOT UNDERGOING COLONOSCOPY OR SIGMOIDOSCOPY

We compared reported reasons for not undergoing colonoscopy screening for African Americans and whites

Table 3. Colorectal Cancer Screening and Family History of Colon Cancer[a]

	FDR Diagnosed <50 y or Multiple FDRs (n=793)	Single FDR Diagnosed ≥50 y (n=1798)	No Family History (n=39 239)
All Ages			
Colonoscopy in past 5 y			
White	1 [Reference]	1 [Reference]	1 [Reference]
African American	0.51 (0.38-0.68)	0.75 (0.58-0.96)	0.68 (0.60-0.77)
P value	<.001	.02	<.001
Colonoscopy in past 10 y			
White	1 [Reference]	1 [Reference]	1 [Reference]
African American	0.41 (0.30-0.54)	0.70 (0.53-0.93)	0.66 (0.60-0.73)
P value	<.001	.02	<.001
Sigmoidoscopy in past 5 y			
White	1 [Reference]	1 [Reference]	1 [Reference]
African American	1.09 (0.66-1.81)	1.07 (0.67-1.73)	1.22 (1.10-1.34)
P value	.74	.77	<.001
Participants Aged 40-49 y			
Colonoscopy in past 5 y			
White	1 [Reference]	1 [Reference]	1 [Reference]
African American	0.52 (0.32-0.84)	0.41 (0.27-0.62)	0.60 (0.49-0.75)
P value	.008	<.001	<.001
Colonoscopy in past 10 y			
White	1 [Reference]	1 [Reference]	1 [Reference]
African American	0.42 (0.27-0.65)	0.39 (0.25-0.60)	0.57 (0.47-0.69)
P value	<.001	<.001	<.001
Sigmoidoscopy in past 5 y			
White	1 [Reference]	1 [Reference]	1 [Reference]
African American	1.10 (0.46-2.65)	1.08 (0.54-2.16)	1.08 (0.95-1.23)
P value	.83	.83	.26
Participants Aged ≥50 y			
Colonoscopy in past 5 y			
White	1 [Reference]	1 [Reference]	1 [Reference]
African American	0.50 (0.34-0.74)	0.87 (0.65-1.16)	0.81 (0.76-0.88)
P value	<.001	.34	<.001
Colonoscopy in past 10 y			
White	1 [Reference]	1 [Reference]	1 [Reference]
African American	0.41 (0.26-0.62)	0.80 (0.58-1.10)	0.76 (0.71-0.81)
P value	<.001	.16	<.001
Sigmoidoscopy in past 5 y			
White	1 [Reference]	1 [Reference]	1 [Reference]
African American	1.01 (0.56-1.81)	1.07 (0.66-1.74)	1.27 (1.13-1.44)
P value	.98	.79	<.001

[a] Adjusted for the listed covariates and age, sex, educational status, insurance status, income, total number of first-degree relatives (FDRs), and time since last health care provider visit. Data are given as adjusted odds ratios (95% confidence intervals).

(**Table 5**). In subjects with any family history of colon cancer, African Americans were more likely to report that the procedure had not been recommended by their physician or other health care provider when compared with whites. African Americans with a family history of colon cancer were less likely to report procedure cost and embarrassment as reasons for not undergoing screening.

COMMENT

In this large cross-sectional analysis we found marked underuse of colonoscopy procedures in individuals with strong family histories of colon cancer. African Americans with multiple affected FDRs were half as likely to have undergone recommended screening procedures when compared with whites, even after adjusting for education, annual income, and insurance status. For both African Americans and whites with family histories of colon cancer, the most common reason given for not having had a colonoscopy or flexible sigmoidoscopy was the lack of a recommendation from their health care provider, and this reason was more commonly reported by African Americans.

Recommendations regarding CRC screening practices in individuals with family histories have been quite consistent. The AGA, American College of Gastroenterology (ACG),[4] American Cancer Society,[3,13] American Society of Colon and Rectal Surgeons,[14] American Society of Clinical Oncology,[15] and National Comprehensive Cancer Network[16] advise colonoscopy screening beginning at age 40 years or 10 years before the earliest cancer in the family with follow-up screenings every 5 years. The

Table 4. Personal History of Colon Polyps in Participants Reporting Ever Undergoing a Colonoscopy or Flexible Sigmoidoscopy[a,b]

	FDR Diagnosed <50 y or Multiple FDRs (n=349)	Single FDR Diagnosed ≥50 y (n=690)	No Family History (n=10 205)
All ages			
White	1 [Reference]	1 [Reference]	1 [Reference]
African American	0.29 (0.20-0.42)	0.40 (0.28-0.59)	0.45 (0.39-0.52)
Participants aged 40-49 y			
White	1 [Reference]	1 [Reference]	1 [Reference]
African American	0.22 (0.09-0.53)	0.16 (0.06-0.42)	0.39 (0.29-0.51)
Participants aged ≥50 y			
White	1 [Reference]	1 [Reference]	1 [Reference]
African American	0.28 (0.18-0.43)	0.50 (0.33-0.75)	0.46 (0.40-0.53)

[a] Adjusted for the listed covariates as well as age (continuous), sex, educational status, total number of first-degree relatives (FDRs), body mass index (calculated as weight in kilograms divided by height in meters squared), tobacco use, alcohol use, physical activity level, calcium use, folate use, regular aspirin use, and time since last medical visit. Data are given as adjusted odds ratios (95% confidence intervals).
[b] $P < .001$ for all analyses.

US Preventive Services Task Force has not been as specific and describes the early initiation of CRC screening in patients with an FDR diagnosed before age 60 years as a "reasonable" strategy.[17] Notably, although family history has been a consistent factor influencing CRC screening decisions, recently the ACG has proposed modifying the age at which to begin screening in African Americans from 50 years to 45 years.[18] These recommendations stem from consistent findings indicating that African Americans tend to be diagnosed at earlier ages than whites.[6,19] Although, crudely, we found African Americans reported earlier ages for colon cancer diagnoses when compared with whites ($P = .04$), after adjusting for age at the time of the interview, we found no significant difference by race ($P = .78$).

Few prior studies have examined CRC screening rates in individuals with family histories of the disease. Fletcher et al surveyed 1870 patients aged 35 to 55 years and found that only 45% of individuals younger than 50 years with a family history of CRC had been screened.[20] Factors contributing to the discrepancies in screening rates between this study and ours are likely secondary to patient demographics. In the study by Fletcher et al, more than 80% of the sample reported an annual household income of $50 000 or greater and 77% had a college degree. In the SCCS, only 4% of respondents reported an income at this level with only 9% having completed college.

We did find that African Americans were more likely to report that their physician or other health care provider had not recommended the procedures when compared with whites. However, it is unlikely that this difference completely explains the variation in the rate of colonoscopy procedures. There are likely patient-specific factors that affect how family history information is integrated into patient care. A prior study reported that African Americans with a family history of CRC were less likely to perceive themselves at increased risk for cancer when compared with whites with positive family histories (36.5% vs 82.5%, $P = .004$).[21] Bastani et al similarly found that African Americans with a family history of CRC tended to be less likely to perceive themselves as at increased risk when compared with whites.[22]

Table 5. Reasons for Not Undergoing Colonoscopy or Flexible Sigmoidoscopy in Participants Without Prior Endoscopic Procedures[a]

Reason	African American	White	*P* Value
≥1 Affected First-Degree Relatives			
Not recommended by physician	738 (59.3)	227 (51.0)	.003
Cost	113 (9.1)	77 (17.3)	<.001
Discomfort	45 (3.6)	25 (5.6)	.07
Fear	54 (4.3)	24 (5.4)	.36
Embarrassment	11 (0.9)	10 (2.3)	.03
Forgot	36 (2.9)	4 (0.9)	.02
No reason given	238 (19.1)	96 (21.6)	.26
No Family History of Colon Cancer			
Not recommended by physician	15 268 (63.3)	4104 (63.3)	.99
Cost	1812 (7.5)	877 (13.5)	<.001
Discomfort	767 (3.2)	303 (4.7)	<.001
Fear	684 (2.8)	159 (2.5)	.09
Embarrassment	235 (1.0)	121 (1.9)	<.001
Forgot	413 (1.7)	94 (1.5)	.14
No reason given	5370 (22.3)	1171 (18.1)	<.001

[a] Data are given as number (percentage) of participants unless otherwise indicated.

Having a family history of CRC is a risk factor for adenomatous polyps.[23,24] Our study demonstrated a similar finding, with higher rates of colorectal polyps in individuals with family histories of colon cancer. In our study, polyps were identified by self-report. Thus, one potential explanation for our finding of fewer personal diagnoses of colon polyps in African Americans may be related to reporting bias. However, a study that examined Medicare claims data for approximately 1.8 million colonoscopy procedures similarly noted a lower rate of polyp detection in African Americans vs whites.[25]

If African Americans are less likely to have polyps detected on colonoscopy compared with whites, this may be related to 2 possible mechanisms. Biologically, African Americans could have fewer polyps overall yet a greater proportion of polyps that proceed to malignancy. This mechanism could reconcile a lower polyp

rate with an increased cancer incidence. Another mechanism may be related to racial differences in colonoscopy miss rates. A recent systematic review reported that colonoscopy miss rates increase with decreasing polyp size,[26] and other studies have suggested that right-sided lesions may also be more likely to be missed on colonoscopy examination.[27,28] When compared with a referent standard of virtual colonoscopy, optical colonoscopy predominately missed sessile, as opposed to pedunculated, adenomas.[29] These findings are relevant because right-sided lesions are more common in African Americans as opposed to whites.[30,31] Ozick et al found in a retrospective review of 179 polypectomies in African Americans that right-sided lesions were also less likely to be pedunculated and were smaller than left-sided lesions.[32] Although the right-sided lesions were smaller, they were just as likely to have villous features as left-sided lesions. Thus, it is plausible that race-specific adenoma characteristics may increase the likelihood of missing an adenoma at colonoscopy; however, this hypothesis would have to be rigorously evaluated.

The study has several limitations worth noting. First, family history was self-reported. Nevertheless, studies have suggested that self-reported family history of colon cancer is moderately accurate for FDRs.[33] The SCCS assessed information on FDRs with colon cancer and thus some subjects with multiple second-degree relatives diagnosed as having colon cancer or an FDR with adenomatous polyps may have been classified as having no family history rather than being at elevated risk, but we chose to focus our analysis on occurrences of cancer in FDRs. Because age at cancer diagnosis was dichotomized at 50 years rather than 60 years, our categorizations do not completely match the recommendation put forth by the AGA. This may have the consequence of misclassifying an individual with a single FDR who was diagnosed at age 55 years into the less intensive screening strategy group. In addition, there are several limitations related to the colon cancer screening variables. For one, procedures were all self-reported, and prior studies have suggested that patient self-report may overestimate screening rates.[34,35] Second, the SCCS did not collect information regarding fecal occult blood testing and barium enema as colon cancer screening modalities. Although these screening procedures may have a role in individuals with a single affected relative diagnosed at or after age 60 years, most organizations recommend colonoscopy screening as the modality of choice for individuals with multiple affected relatives or relatives affected at an early age. Finally, it is not well known how accurately individuals can self-report a diagnosis of adenomas. Reporting bias may have been an important factor in the different rates of personal histories of colorectal polyps; however these results remained significant even after adjusting for education level.

In conclusion, in this disadvantaged population, colonoscopy procedures in individuals with family histories of colon cancer are underused. African Americans with a family history are significantly less likely to have undergone colonoscopy, and are less likely to report a personal history of colorectal polyps, than whites with similar family histories. African Americans with family histories of colon cancer who had not undergone endoscopy procedures were more likely to report a lack of health care provider recommendations as a reason for not undergoing screening. Physicians and other health care providers need to elicit family history information for all patients and ensure that African Americans with affected relatives appropriately receive colon cancer screening.

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REFERENCES

1. Johns LE, Houlston RS. A systematic review and meta-analysis of familial colorectal cancer risk. *Am J Gastroenterol.* 2001;96(10):2992-3003.
2. Butterworth AS, Higgins JP, Pharoah P. Relative and absolute risk of colorectal cancer for individuals with a family history: a meta-analysis. *Eur J Cancer.* 2006;42(2):216-227.
3. Smith RA, Cokkinides V, Eyre HJ. American Cancer Society guidelines for the early detection of cancer, 2006. *CA Cancer J Clin.* 2006;56(1):11-25.
4. Winawer S, Fletcher R, Rex D, et al. Colorectal cancer screening and surveillance: clinical guidelines and rationale: update based on new evidence. *Gastroenterology.* 2003;124(2):544-560.
5. Clegg LX, Li FP, Hankey BF, Chu K, Edwards BK. Cancer survival among US whites and minorities: a SEER (Surveillance, Epidemiology, and End Results) Program population-based study. *Arch Intern Med.* 2002;162(17):1985-1993.
6. Polite BN, Dignam JJ, Olopade OI. Colorectal cancer and race: understanding the differences in outcomes between African Americans and whites. *Med Clin North Am.* 2005;89(4):771-793.
7. Coughlin SS, Thompson TD, Seeff L, Richards T, Stallings F. Breast, cervical, and colorectal carcinoma screening in a demographically defined region of the southern U.S. *Cancer.* 2002;95(10):2211-2222.
8. Lemon S, Zapka J, Puleo E, Luckmann R, Chasan-Taber L. Colorectal cancer screening participation: comparisons with mammography and prostate-specific antigen screening. *Am J Public Health.* 2001;91(8):1264-1272.
9. Peterson NB, Murff HJ, Ness RM, Dittus RS. Colorectal cancer screening among men and women in the United States. *J Womens Health (Larchmt).* 2007;16(1):57-65.
10. Schenck AP, Klabunde CN, Davis WW. Racial differences in colorectal cancer test use by Medicare consumers. *Am J Prev Med.* 2006;30(4):320-326.
11. Seeff LC, Nadel MR, Klabunde CN, et al. Patterns and predictors of colorectal cancer test use in the adult U.S. population. *Cancer.* 2004;100(10):2093-2103.
12. Signorello LB, Hargreaves MK, Steinwandel MD, et al. Southern Community Cohort Study: establishing a cohort to investigate health disparities. *J Natl Med Assoc.* 2005;97(7):972-979.
13. Smith RA, von Eschenbach AC, Wender R, et al. American Cancer Society guidelines for the early detection of cancer: update of early detection guidelines for prostate, colorectal, and endometrial cancers: also: update 2001—testing for early

lung cancer detection [published correction appears in *CA Cancer J Clin*. 2001;51(3):150]. *CA Cancer J Clin*. 2001;51(1):38-75.
14. Ko C, Hyman NH. Practice parameter for the detection of colorectal neoplasms: an interim report (revised). *Dis Colon Rectum*. 2006;49(3):299-301.
15. Desch CE, Benson AB III, Somerfield MR, et al. Colorectal cancer surveillance: 2005 update of an American Society of Clinical Oncology practice guideline. *J Clin Oncol*. 2005;23(33):8512-8519.
16. National Comprehensive Cancer Network. NCCN Clinical Practice Guidelines in Oncology: Colorectal Cancer Screening: V.1.2007. http://www.nccn.org/professionals/physician_gls/pdf/colorectal_screening.pdf. Accessed August 23, 2007.
17. US Preventive Services Task Force. Screening for colorectal cancer: recommendation and rationale. *Ann Intern Med*. 2002;137(2):129-131 .
18. Agrawal S, Bhupinderjit A, Bhutani MS, et al. Colorectal cancer in African Americans [published correction appears in *Am J Gastroenterol*. 2005;100(6):1432]. *Am J Gastroenterol*. 2005;100(3):515-523.
19. Jessup JM, McGinnis LS, Steele GD Jr, Menck HR, Winchester DP. The National Cancer Data Base: report on colon cancer. *Cancer*. 1996;78(4):918-926.
20. Fletcher RH, Lobb R, Bauer MR, et al. Screening patients with a family history of colorectal cancer. *J Gen Intern Med*. 2007;22(4):508-513.
21. Murff HJ, Peterson NB, Greevy RA, Shrubsole MJ, Zheng W. Early initiation of colorectal cancer screening in individuals with affected first-degree relatives. *J Gen Intern Med*. 2007;22(1):121-126.
22. Bastani R, Gallardo NV, Maxwell AE. Barriers to colorectal cancer screening among ethnically diverse high- and average-risk individuals. *J Psych Oncol*. 2001;19(3/4):65-83.
23. Bazzoli F, Fossi S, Sottili S, et al. The risk of adenomatous polyps in asymptomatic first-degree relatives of persons with colon cancer. *Gastroenterology*. 1995;109(3):783-788.
24. Guillem JG, Forde KA, Treat MR, Neugut AI, O'Toole KM, Diamond BE. Colonoscopic screening for neoplasms in asymptomatic first-degree relatives of colon cancer patients: a controlled, prospective study. *Dis Colon Rectum*. 1992;35(6):523-529.
25. Cooper GS, Chak A, Koroukian S. The polyp detection rate of colonoscopy: a national study of Medicare beneficiaries. *Am J Med*. 2005;118(12):1413. doi:10.1016/j.amjmed.2005.06.019.
26. van Rijn JC, Reitsma JB, Stoker J, Bossuyt PM, van Deventer SJ, Dekker E. Polyp miss rate determined by tandem colonoscopy: a systematic review. *Am J Gastroenterol*. 2006;101(2):343-350.
27. Bressler B, Paszat LF, Vinden C, Li C, He J, Rabeneck L. Colonoscopic miss rates for right-sided colon cancer: a population-based analysis. *Gastroenterology*. 2004;127(2):452-456.
28. Rex DK, Rahmani EY, Haseman JH, Lemmel GT, Kaster S, Buckley JS. Relative sensitivity of colonoscopy and barium enema for detection of colorectal cancer in clinical practice. *Gastroenterology*. 1997;112(1):17-23.
29. Pickhardt PJ, Nugent PA, Mysliwiec PA, Choi JR, Schindler WR. Location of adenomas missed by optical colonoscopy. *Ann Intern Med*. 2004;141(5):352-359.
30. Johnson H Jr, Margolis I, Wise L. Site-specific distribution of large-bowel adenomatous polyps: emphasis on ethnic differences. *Dis Colon Rectum*. 1988;31(4):258-260.
31. Odelowo OO, Hoque M, Begum R, Islam KK, Smoot DT. Colonoscopy for colorectal cancer screening in African Americans. *J Assoc Acad Minor Phys*. 2002;13(3):66-68.
32. Ozick LA, Jacob L, Donelson SS, Agarwal SK, Freeman HP. Distribution of adenomatous polyps in African Americans. *Am J Gastroenterol*. 1995;90(5):758-760.
33. Murff HJ, Spigel DR, Syngal S. Does this patient have a family history of cancer? an evidence-based analysis of the accuracy of family cancer history. *JAMA*. 2004;292(12):1480-1489.
34. Gordon NP, Hiatt RA, Lampert DI. Concordance of self-reported data and medical record audit for six cancer screening procedures. *J Natl Cancer Inst*. 1993;85(7):566-570.
35. Hiatt RA, Perez-Stable EJ, Quesenberry C Jr, Sabogal F, Otero-Sabogal R, McPhee SJ. Agreement between self-reported early cancer detection practices and medical audits among Hispanic and non-Hispanic white health plan members in northern California. *Prev Med*. 1995;24(3):278-285.