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Race, Ethnicity, and Sex Affect Risk for Polyps Greater than 9 mm in Average-risk Individuals

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Abstract

Background & Aims—Colorectal cancer risk differs based on patient demographics. We aimed to measure the prevalence of significant colorectal polyps in average-risk individuals and to determine differences based on age, sex, race, or ethnicity.

Methods—In a prospective study, colonoscopy data were collected, using an endoscopic report generator, from 327,785 average-risk adults who underwent colorectal cancer screening at 84 gastrointestinal practice sites from 2000 to 2011. Demographic characteristics included age, sex, race, and ethnicity. The primary outcome was the presence of suspected malignancy or large polyp(s) >9 mm. The benchmark risk for age to initiate screening was based on white men, 50–54 years old.

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Results—Risk of large polyps and tumors increased progressively in men and women with age. Women had lower risks than men in every age group, regardless of race. Blacks had higher risk than whites from ages 50 through 65 years and Hispanics had lower risk than whites from ages 50 through 80 years. The prevalence of large polyps was 6.2% in white men 50–54 years old. The risk was similar among the groups of white women 65–69 years old, Black women 55–59 years old, Black men 50–54 years old, Hispanic women 70–74 years old, and Hispanic men 55–59 years old. The risk of proximal large polyps increased with age, female sex, and Black race.

Conclusions—There are differences in the prevalence and location of large polyp and tumors in average-risk individuals based on age, sex, race, and ethnicity. These findings could be used to select ages at which specific groups should begin colorectal cancer screening.

Keywords

Colon cancer; early detection; CRC; rate

Introduction

Colonoscopy is the most commonly used endoscopic procedure in the United States, with approximately 14 million procedures performed annually¹. Since the publication of colonoscopy screening studies from the United States in 2000^{2,3}, and approval of colonoscopy screening for Medicare beneficiaries in 2001, the use of colonoscopy for colorectal cancer (CRC) screening has increased in the United States^{4,5}. Current CRC screening guidelines endorse the use of colonoscopy as a screening option^{6–9} to detect early stage cancer and cancer precursor lesions (adenomas). There is growing evidence that that detection and removal of adenomas can reduce CRC mortality¹⁰.

Most current guidelines recommend initiation of screening at age 50 years for all average-risk men and women^{6,7}. However, evidence indicates age-adjusted CRC rates are lower in women than in men¹¹. Advanced adenoma development may be delayed for at least 5 to 10 years in women^{12,13}. There is also evidence that CRC incidence and mortality are higher in Blacks than whites¹⁴, and Blacks may have higher rates of cancer precursor lesions compared to whites¹⁵. The American College of Gastroenterology has called for early screening in Blacks at age 45 years, based on the increased risk of cancer⁸. The American College of Physicians has suggested that Blacks initiate screening at age 40 years, as part of a “best practice advice” statement⁹. Hispanics have lower rates of CRC compared to whites¹¹. These data call into question the effectiveness of a screening strategy of one-size-fits-all. If age-adjusted risk of CRC or important cancer precursor lesions differs based on sex, race or ethnicity, should the initiation age for CRC screening be the same for all?

We used a large national endoscopic database to determine if the prevalence of tumors or large polyps >9 mm differed based on age, sex or race and ethnicity in individuals undergoing average-risk screening colonoscopy from 2000–2011. These large lesions are a surrogate for advanced neoplasia, defined as tubular adenoma ≥10 mm, adenoma with villous histology, high-grade dysplasia or invasive cancer. These findings could inform a risk-based strategy for initiation of CRC screening.

Methods

Clinical Outcomes Research Initiative (CORI)

Data were derived from the Clinical Outcomes Research Initiative (CORI), established in 1995 to study endoscopy utilization and outcomes in diverse practice settings throughout the United States. Endoscopists use a structured computerized endoscopic report generator to produce endoscopic reports. The data transmitted from the local site to the National Endoscopic Database does not contain most patient or provider identifiers and qualifies as a Limited Data Set under 45 C.F.R. Section 164.514(e)(2). A federal Certificate of Confidentiality provides additional protections to this data set. Previously we reported results of colonoscopy utilization and outcomes from January, 2000 to August, 2002^{16,17}, and colonoscopy screening data from 2004-2005¹⁵.

Practice Sites

Complete colonoscopy reports received between January 1, 2000 and December 31, 2011, were included. We excluded reports in patients less than 40 years old.

The colonoscopy reports come from 84 practices, which were diverse and representative of US endoscopy practices¹⁸ including community practices and endoscopy centers (78.5%), academic centers (8.3%) and VA medical centers (13.2%).

Some practice sites changed during the study time period. 84 practices participated during some or all of the 2000-2011, and 26 “stable” practices contributed data without interruption during the study period.

Utilization measurements

We assessed age at time of endoscopy, sex and race/ethnicity. The endoscopist provides the information on race/ethnicity using the US census methodology, which requests classification by race, and then by ethnicity (Hispanic or non-Hispanic). For this analysis, race was categorized into 5 groups: white non-Hispanic (hereafter referred to as “white”), black non-Hispanic (“Black”), other non-Hispanic (“other”), Hispanic of any race (“Hispanic”), and race unknown. Procedure indications are provided by the endoscopist. Patients were identified as average-risk by the endoscopist, and further defined by the absence of following descriptors: family history of CRC or polyps, positive fecal occult blood test, or any other lower GI symptoms. This analysis is limited to individuals classified as average-risk with no other indications for colonoscopy.

Outcome measurement

Colon neoplasia was the key outcome of colonoscopy, because it is the primary target of screening in asymptomatic individuals. Endoscopists are asked to provide detailed descriptors of every polyp, including size, location, morphology (pedunculated, sessile or flat) and method of removal. Determination of neoplasia in a polyp requires additional histopathology results, which arrive days after the endoscopy. Pathology results were available in 20% of the endoscopy reports, which are a representative sample of the entire cohort in terms of patient demographics and procedure indications¹⁹.

Our endpoint was the finding of one or more polyps sized more than 9mm or described as a tumor, hereafter termed **large polyp**. This endpoint is a surrogate for advanced neoplasia. Our previous analysis of 13,992 screening examinations with histopathology, demonstrated that this surrogate was robust¹⁹. In this analysis, 4.8% of large polyps (sized more than 9mm) did not have advanced histology, and 2.9% of small polyps (1-9mm) did have advanced histology, and would be misclassified with our surrogate endpoint.

Analysis

Colonoscopy indications and findings were analyzed for patient groups based on age, sex, and race/ethnicity. Comparison of demographic data was performed by using chi-square tests. Age and sex-adjusted odds ratios (OR) and 95% confidence intervals (CI) were calculated to examine the relationships among race, age and sex to risk of a large polyp(s). Cochran-Armitage test was used to measure trends in the data²⁰. The estimated number of procedures required for an endoscopist to perform before observing one finding of a large polyp, or number needed to screen (NNS), was calculated as the inverse of the proportion of procedures with the outcome. The benchmark NNS was white men, age 50 to 54 years. All analyses were performed with version 9.2 of SAS software (SAS Institute Inc, Cary, NC).

Results

Utilization of screening relative to all colonoscopy exams

The database included 1,292,346 colonoscopy procedures from 1,096,780 unique patients for all indications from 2000 to 2011. CRC screening exams of any kind accounted for 37.2% of all colonoscopies, with average-risk screening accounting for 25.4% of all exams (327,785 procedure reports from 323,375 unique patients). **Average-risk** screening exams represented 20.8% of colonoscopies in individuals less than 50 years, 42.9% of exams from age 50 to 74 years, and 20.3% of exams in individuals age 75 years and older.

Average-risk screening colonoscopy exams

The demographics of average-risk individuals are described in Table 1. Excluding VA centers, which were predominantly male, females account for 50.3% of average-risk screenees. Among patients receiving average-risk screening, whites account for 83.6%, Blacks 5.7% and Hispanics 7.7%. More than 95% of exams were performed between the age of 50 and 79 years.

Outcomes of average-risk screening based on demographic characteristics

Age—The key outcome measurement was one or more large polyps. Individuals were stratified by age and sex (Table 2). The proportion with one or more large polyps steadily increased with age. Risk of large polyps progressively increases with advancing age beyond age 75 years in both men ($z = 23.5$, $P < 0.001$) and women ($z = 17.8$, $P < 0.001$).

Sex—6.1% of average-risk males age 50-54 had large polyp(s) (NNS = 16). At the same age, the NNS for women is 25. Women had a similar NNS as 50-54 year old men by age **65-69 years** (NNS=17). Across all age groups, women had a lower prevalence of large polyps than men.

Blacks versus whites—We determined the prevalence of large polyps in Blacks and whites receiving average-risk screening exams, stratified by age and sex (Table 3). In men less than 50 years, the prevalence of large polyps was similar in average-risk Blacks and whites (5.0% vs. 5.3%; OR: 0.93; 95% CI: 0.57-1.52), but the sample of Black men is small (n = 380). Compared to white men, Black men have a higher prevalence of large polyps in age groups 50-54 years (7.1% vs. 6.2%; OR: 1.17; 95% CI: 1.02-1.35), 55-59 years (8.5% vs. 7.4%; OR: 1.16; 95% CI: 0.996-1.36), 60-64 years (11.5% vs. 8.6%; OR: 1.38; 95% CI: 1.18-1.61), and 65-69 years (12.0% vs. 9.7%; OR: 1.27; 95% CI: 1.04-1.56). After age 70, prevalence is similar in Black and white men.

Women less than age 50 years, had a statistically similar risk among average-risk Blacks compared to whites (5.6% vs. 3.5%; OR 1.66; 95% CI 0.93-2.96). Compared to white women, Black women had higher prevalence of large polyps at ages 50 to 54 years (5.2% vs. 4.2%; OR: 1.25; 95% CI: 1.06-1.47), 55 to 59 years (6.6% vs. 4.5%; OR: 1.51; 95% CI: 1.25-1.82), and 60 to 64 years (6.9% vs. 5.2%; OR: 1.35; 95% CI: 1.09-1.67). Black and white women older than 65 years had similar prevalence of large polyps (Table 3).

Hispanic versus whites (Table 3)—Average-risk Hispanic men and women have a 25% lower risk of large polyps compared to whites from age 50 to 79 years (5.1% vs. 6.7%; OR: 0.75; 95% CI 0.70 - 0.79). We analyzed prevalence of large polyps in 5 year age groups. Hispanic women have a lower prevalence of large polyps compared to white women from age 50 to 69 years. Hispanic men have a lower prevalence of large polyps compared to white men from age 50 to 64 years.

Comparison of prevalence of large polyps using risk of large polyps in white men age 50 to 54 years as benchmark—We determined the NNS to detect one patient with large polyp(s) for each group relative to a benchmark of screening white men at age 50-54 years. Compared to white men age 50 to 54 (6.16%), Hispanic men have similar prevalence of large polyps at age 55-59 years (6.24%; OR: 1.01; 95% CI: 0.86-1.20), and Hispanic women have similar prevalence at age 70-74 years (6.15%; OR: 1.00; 95% CI: 0.77-1.29). Black men have a higher prevalence than white men at age 50-54 years (OR 1.17; 95% CI: 1.02-1.35), but not before age 50 years. Compared to white men, age 50 to 54 years), Black women, age 50 to 54 years have a slightly lower prevalence of large polyps (5.2% vs 6.2% as benchmark white men age 50-54 years) (OR 0.83; 95% CI: 0.71-0.98) and a similar prevalence at age 55-59 years (OR 1.07; 95% CI 0.89-1.28). These data indicate that a risk-based approach would result in variation in the age of initiation of screening depending on sex, race and ethnicity.

Prevalence of proximal versus distal large polyps (Table 4)—The prevalence of large proximal polyps (as a proportion of all large polyps) progressively increases with age (z=11.9, p<0.001). Men are less likely than women to have proximal large polyps (OR 0.89; 95% CI 0.84-0.94). Blacks have a higher risk (OR 1.15; 1.03-1.29), and Hispanics have a lower risk (OR 0.88; 95% CI 0.79-0.99) compared to whites (Table 5).

Misclassification bias and changes over time—Race and ethnicity were identified by the endoscopist, and therefore subject to the possibility of misclassification. We

performed a sensitivity analysis by randomly assigning misclassification of race or ethnicity by 5% in either direction (or both directions). There were only slight changes to statistical significance of some findings, while the overall pattern of results remained remarkably stable regardless of the method of random reclassification. Screening with colonoscopy was not widespread in the early portion of our study period, and it is possible that the latter period may represent “true” screening. We determined if there were changes in outcomes during the study time period by considering outcomes from 2000-2005 and 2006-2011. There were changes in large polyp prevalence, but outcome trends by sex, race and ethnicity were similar (Appendix 1).

Discussion

Most practice guidelines^{6,7} recommend initiation of CRC screening at age 50 years, when the risk of CRC begins to increase with the goal of early cancer detection or cancer prevention, by detection and removal of important CRC precursors. CRC precursors are now considered an important target of screening^{7,10,21}. One rationale for the uniform initiation age is simplicity of message. Recommendations to initiate screening at different ages based on sex or race could create confusion among health care providers and patients, and result in lower rates of adherence⁷. However, if the risk of detection of important pathology is variable, a strategy recommending the same initiation age for all may not appear rational, and could negatively impact adherence. Our study is the largest analysis of colonoscopy results in average-risk screening from diverse clinical practice settings.

For the sake of illustration, we selected an arbitrary, but non-controversial benchmark group, to determine how a risk-based screening strategy might work. There is agreement by all guideline panels that white men, age 50 to 54 years should be screened for CRC⁶⁻⁹. The prevalence of large polyps is 6.2% and the NNS is 16 to identify one patient with a large polyp. Based on our data, it is not clear that a one-size-fits-all strategy for initiation of screening would result in better outcomes. Currently, no guideline calls for CRC screening average-risk individuals less than 40 or 45 years old, because of the low risk of important pathology. Therefore, some decisions about initiation of screening are already based on risk assessment. If initiation of screening was based on risk of large polyps, this could result in an effective screening program that would lead to cancer prevention²¹, with more rational utilization of colonoscopy resources. Our study considered prevalence of large polyps based on clinically simple risk factors of sex and race and ethnicity, readily available to primary care providers.

Sex

Our results provide strong evidence that there are important sex differences in the detection of high-risk lesions during screening colonoscopy. Women have a lower risk than men across all age groups, consistent with other studies^{12,13,22}. A microsimulation model²⁴ estimates a 4 to 8 year delay in CRC incidence and mortality in women, and that the number needed to be screened to detect an advanced adenoma was higher in women. Our data provide a large sample of screening exams in men and women which may inform the data used in this model.

Regula et al.¹² from Poland and Ferlitsch et al.¹³ from Austria observed a 10 year difference in rates of advanced adenomas for men versus women undergoing screening colonoscopy. Brenner et al.²² found that the 10 year cumulative incidence rates of colorectal cancer among men age 50, 55 and 60 years of age are similar to rates in women who are 4 to 6 years older. These populations were predominantly Caucasian. In an analysis of the 30 year outcomes of persons enrolled in Minnesota Colon Cancer Control study using fecal occult blood test, there was no demonstrated benefit of screening in women less than 60 years old²³. We believe this body of data support consideration of a risk-based screening strategy which would result in delayed initiation in white and Hispanic women compared to our reference group of white men age 50-54 years.

Race and Ethnicity—There are differences in prevalence of large polyps based on race and ethnicity. CRC incidence and mortality is higher in Blacks than whites¹¹, prompting some expert panels to endorse early screening (before age 50 years) for Blacks^{8,9}. However, it is not clear that earlier screening would be superior to intensification of screening for Blacks, beginning at age 50 years. A microsimulation model²⁴ suggested that there might be some benefit to early screening (age 47 years) in Blacks. However, data from a single safety net hospital found that the risk of advanced neoplasia was not higher in Blacks, after adjusting for other known CRC risk factors²⁵. In a prior smaller analysis of CORI data from 2004-2005, we found that Blacks, age 60-69 years, had a higher risk of large polyps compared to whites, and were more likely to have proximal large polyps¹⁵. The current sample is much larger and more robust, demonstrating higher rates of large polyps in Black men (age 50 to 69) and Black women (age 50-64) compared to respective white men and women, with a higher risk of proximal large polyps. We did not detect race differences before age 50 years, but the sample size in this age group was small, since screening is not routinely recommended in this age group. When we examined outcomes of 40 to 49 year-old patients with non-specific abdominal complaints (pain, bloating, change in bowel habits), there was no difference in prevalence of large polyps in Blacks versus whites. Lacking evidence for increased risk before age 50 years, our current data support intensification of screening in Black men and women at age 50 years.

We find that Hispanic men and women have lower age-adjusted prevalence of large polyps compared to whites. Using white men, age 50-54 years as the benchmark, Hispanic men have a similar risk at age 55-59 years, and Hispanic women have a similar risk at age 70-74 years. These data for white and Hispanic women would suggest that initiation of screening might be safely delayed until age 60 years.

Our data also highlight other aspects of average-risk screening with colonoscopy. Screening remains a common indication for colonoscopy in individuals over age 74 years, despite recommendations from the US Preventive Services Task Force⁶ that average-risk screening may not be needed if there has been prior screening. The guideline further recommends against screening at age 85 year or older due to increasing risk and decreasing benefit. We show that the prevalence of large polyps continues to increase with age, including patients older than 85 years. Our data suggest CRC screening may be justified in the elderly, depending on co-morbid conditions and life expectancy.

The risk of proximal large polyps is increased with advancing age, female sex and Black race. Prior data have suggested that colonoscopy may be less protective in the proximal colon^{26,27} and that interval colorectal cancers (after a negative colonoscopy) occur more commonly in the proximal colon^{28,29}. Our data are consistent with the prior studies, and emphasize the importance of a complete, high-quality colonoscopy.

Our study has several limitations. The cohort may not be representative of the US population. However, we have previously shown that patient demographics in CORI are similar to a CMS subset of individuals receiving colonoscopy¹⁸. The underrepresentation of Blacks and Hispanics may represent the true utilization of colonoscopy in the United States. This analysis is limited to demographic risk factors. Age, sex, race and ethnicity are among the most important risk factors for CRC in average-risk individuals with no family history of CRC. Other factors including smoking, body mass index, diet, physical activity, use of aspirin and non-steroidal anti-inflammatory drugs may affect the risk of developing CRC and adenomas³⁰ and were not considered in our analysis. It is not known if these exposures result in earlier onset of large polyps. Future studies should consider whether these lifestyle factors modulate risk for different demographic subgroups, sufficient to modify the initiation age for screening.

The CORI database provides snapshots of endoscopic practice which depend on data provided in the endoscopic report. We believe these data are at least as accurate as any part of the official medical record. Procedure indications are provided by the endoscopists, who are queried about the primary indication. The definition of average-risk screening required the absence of any other indication for colonoscopy, reducing the likelihood of misclassification. Participation of practice sites changed during the study time period, resulting in changes in patient demographics, depending on the type and location of practice. Outcomes data are adjusted for age, sex and race to reduce the likelihood that practice changes affected the key outcome. The selection of large polyp(s) as a study endpoint is discussed in the methods. We have previously demonstrated a strong correlation between this endpoint and the prevalence of advanced neoplasia. The prevalence of large polyps in our study, and advanced neoplasia in other studies is similar³¹. The size of polyps is entered by the endoscopist, and we have no way to verify the accuracy, so that misclassification based on size is possible.

This is the largest and most comprehensive analysis of average-risk screening with colonoscopy in the United States. The use of colonoscopy for primary screening has increased dramatically from 2000 to 2011. There is significant variation in the prevalence and location of large polyps in average-risk individuals receiving screening colonoscopy based on age, sex, race and ethnicity. We believe these data, combined with prior studies^{12,13,22,23} are compelling enough to consider customization of the initiation age of screening based on the risk of large polyps. Such a strategy would identify important colon pathology which would precede the development of CRC in most individuals. This strategy would require further study to determine the impact on key outcomes of CRC incidence and mortality, as well as utilization of resources.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Abbreviations

CI	confidence interval
CORI	Clinical Outcomes Research Initiative
CRC	colorectal cancer
NNS	number needed to screen
OR	odds ratio
VA	Veteran's Affairs

Table 1
Patient Demographics - Average-Risk Screening Colonoscopy

	All Practices				Excluding VA Practices			
	Female		Male		Female		Male	
	n	%	n	%	N	%	n	%
Age								
40 – 50	2647	1.8%	3725	2.1%	2619	1.8%	3342	2.3%
50 – 59	76392	50.9%	87852	49.4%	75299	50.7%	74613	51.0%
60 – 69	46404	30.9%	58842	33.1%	46012	31.0%	45322	30.9%
70 – 79	21093	14.1%	23822	13.4%	21025	14.2%	20041	13.7%
80	3552	2.4%	3456	1.9%	3540	2.4%	3121	2.1%
Total	150088		177697		148495		146439	
Race/Ethnicity								
White	122140	81.4%	151753	85.4%	120858	81.4%	125509	85.7%
Black	9188	6.1%	9413	5.3%	8979	6.0%	6646	4.5%
Hispanic	13660	9.1%	11695	6.6%	13613	9.2%	10003	6.8%
Other	4696	3.1%	4327	2.4%	4647	3.1%	3842	2.6%
Unknown	404	0.3%	509	0.3%	398	0.3%	439	0.3%
Total	150088		177697		148495		146439	

Table 2
Tumor / Large Polyp by Age and Sex in Average-Risk Screening COL, 2000-2011

Sex		40 - 49	50 - 54	55 - 59	60 - 64	65 - 69	70 - 74	75 - 79	80
Female	n	2647	45079	31313	24368	22036	13175	7918	3552
	Prevalence	3.4%	4.0%	4.6%	5.2%	5.8%	6.4%	7.1%	7.3%
	NNS *	29.8	24.8	21.9	19.2	17.2	15.5	14.1	13.6
Male	n	3725	49957	37895	33531	25311	15265	8557	3456
	Prevalence	5.2%	6.1%	7.3%	8.6%	9.6%	9.7%	10.3%	11.0%
	NNS	19.3	16.4	13.6	11.7	10.4	10.3	9.7	9.1

* Estimated number needed to screen in order to observe 1 exam with tumor / large polyp finding

Table 3
Tumor/Polyp > 9 mm in Black and Hispanic patients, compared to Whites, by age and sex

Age Group	Race / Ethnicity	n	Large Polyp Prevalence	OR (ref = White)	95% CI	n	Large Polyp Prevalence	OR (ref = White)	95% CI
		Female				Male			
<50	White	1846	3.5%	-	-	2887	5.3%	-	-
	Black	266	5.6%	1.66	0.93-2.96	380	5.0%	0.93	0.57-1.52
	Hispanic	413	2.2%	0.62	0.31-1.26	332	5.4%	1.02	0.62-1.68
50-54	White	35935	4.2%	-	-	41788	6.2%	-	-
	Black	3177	5.2%	1.25	1.06-1.47	3239	7.1%	1.17	1.02-1.35
	Hispanic	4379	2.6%	0.60	0.50-0.73	3492	4.8%	0.78	0.66-0.91
55-59	White	25144	4.5%	-	-	32031	7.4%	-	-
	Black	2012	6.6%	1.51	1.25-1.82	2222	8.5%	1.16	0.996-1.36
	Hispanic	3025	4.0%	0.89	0.74-1.08	2579	6.2%	0.84	0.71-0.99
60-64	White	19695	5.2%	-	-	28861	8.6%	-	-
	Black	1431	6.9%	1.35	1.09-1.67	1647	11.5%	1.38	1.18-1.61
	Hispanic	2317	4.6%	0.87	0.71-1.07	2164	7.3%	0.84	0.71-0.99
65-69	White	18429	6.0%	-	-	22112	9.7%	-	-
	Black	1114	6.5%	1.08	0.84-1.38	938	12.0%	1.27	1.04-1.56
	Hispanic	1784	4.2%	0.69	0.54-0.87	1543	8.3%	0.84	0.70-1.01
70-74	White	11051	6.5%	-	-	13370	9.8%	-	-
	Black	699	5.6%	0.85	0.61-1.18	586	11.4%	1.19	0.92-1.55
	Hispanic	1041	6.1%	0.94	0.72-1.22	921	7.7%	0.77	0.60-0.99
75-79	White	6886	7.2%	-	-	7588	10.5%	-	-
	Black	351	7.4%	1.03	0.68-1.55	300	11.0%	1.05	0.73-1.52
	Hispanic	507	6.3%	0.87	0.60-1.25	488	7.8%	0.72	0.51-1.01
80	White	3154	7.2%	-	-	3116	10.9%	-	-
	Black	138	10.1%	1.45	0.82-2.56	101	13.9%	1.32	0.74-2.34
	Hispanic	194	7.2%	1.00	0.57-1.75	176	10.8%	0.99	0.61-1.62

Table 4

Proportion with Proximal vs. Distal Tumor / Polyp > 9 mm

		Proximal Large Polyps n = 10,911	Distal Large Polyps N = 10,703	Within Large Polyp Cohort with Known Location	
				% Proximal	% Distal
Age	n			N/A	N/A
	Mean (y), SD	63.1 (8.8)	61.7 (8.6)		
	< 50	117 (1.8%)	165 (2.6%)	41.5%	58.5%
	50 – 54	2228 (2.3%)	2630 (2.8%)	45.9%	54.1%
	55 – 59	1984 (2.9%)	2222 (3.2%)	47.2%	52.8%
	60 – 64	2122 (3.7%)	2021 (3.5%)	51.2%	48.8%
	65 – 69	1994 (4.2%)	1726 (3.6%)	53.6%	46.4%
	70 – 74	1255 (4.4%)	1066 (3.7%)	54.1%	45.9%
	75 – 79	826 (5.0%)	618 (3.8%)	57.2%	42.8%
	80	385 (5.5%)	255 (3.6%)	60.2%	39.8%
Sex					
	Male	177697	7102 (4.0%)	49.5%	50.5%
	Female	150088	3601 (2.4%)	52.4%	47.6%
Race					
	White	273893	9085 (3.3%)	50.6%	49.4%
	Black	18601	661 (3.6%)	53.3%	46.7%
	Hispanic	25355	681 (2.7%)	47.4%	52.6%
	Other	9023	256 (2.8%)	44.8%	55.2%
	Unknown	913	20 (2.2%)	42.9%	57.1%

Table 5

Factors associated with increased odds of proximal location among those with large polyp/tumor on Colonoscopy.

Variable	Level	OR	95% CI
Age Group	<50	Reference	
	50-54	1.19	0.93-1.52
	55-59	1.27	0.99-1.62
	60-64	1.49	1.17-1.91
	65-69	1.64	1.28-2.09
	70-74	1.67	1.30-2.14
	75-79	1.88	1.45-2.44
	80	2.13	1.60-2.83
Sex	Female	Reference	
	Male	0.89	0.84-0.94
Race / Ethnicity	White	Reference	
	Black	1.15	1.03-1.29
	Hispanic	0.88	0.79-0.99
	Other	0.80	0.67-0.97
	Unknown	0.69	0.35-1.36

(n = 21,614 procedures with polyp $\geq$ 10 mm or suspected tumor)