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Association of Race and Ethnicity with Healthcare Utilization for Inflammatory Bowel Disease in the United States: A Retrospective Cohort Study

Abraham Segura, MD^{1,2}, Colleen Brensinger, MS², Virginia Pate, MS³, Shazia M. Siddique, MD MSHP^{1,2,4}, Lauren Parlett, PHD⁵, Andres Hurtado-Lorenzo, PHD⁶, Michael David Kappelman, MD MPH^{7,*}, James D. Lewis, MD MSCE^{1,2,4,8,*}

¹Division of Gastroenterology and Hepatology, University of Pennsylvania, Philadelphia, Pennsylvania

²Center of Clinical Epidemiology and Biostatistics, Perelman School of Medicine, University of Pennsylvania, Philadelphia, Pennsylvania

³Center for Pharmacoepidemiology, Department of Epidemiology, University of North Carolina at Chapel Hill, Chapel Hill, North Carolina

Corresponding author James D. Lewis, MD, MSCE, University of Pennsylvania, 720 Blockley Hall, 423 Guardian Drive, Philadelphia, Pennsylvania 19104, james.lewis@pennmedicine.upenn.edu.

*Contributed equally

Author contributions:

- Conceptualization: Lewis, Kappelman
- Data curation: Lewis, Brensinger
- Formal analysis: Brensinger, Pate
- Funding acquisition: Lewis, Kappelman, Hurtado-Lorenzo
- Guarantor: Lewis
- Investigation: Lewis, Kappelman
- Methodology: Lewis, Parlett, Brensinger, Pate, Kappelman
- Supervision: Lewis, Kappelman
- Visualization: Lewis, Segura, Brensinger, Pate
- Writing—original draft: Lewis, Segura
- Writing—review and editing: All authors

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⁴Leonard Davis Institute of Health Economics, University of Pennsylvania, Philadelphia, Pennsylvania

⁵Carelon Research, Inc., Wilmington, Delaware

⁶Crohn's & Colitis Foundation, New York, NY

⁷Department of Pediatrics, Division of Pediatric Gastroenterology, University of North Carolina at Chapel Hill, Chapel Hill, North Carolina

⁸Department of Biostatistics, Epidemiology and Informatics, Perelman School of Medicine, University of Pennsylvania, Philadelphia, Pennsylvania

Abstract

Introduction: Advances in medical and surgical therapy have improved the outlook for those affected with Crohn's disease and ulcerative colitis; however, it is unclear if Americans from marginalized racial and ethnic backgrounds have adequate and equitable access to care for inflammatory bowel disease. We evaluated the association between race and ethnicity and healthcare utilization in patients diagnosed with inflammatory bowel disease.

Methods: This study identified children and adults diagnosed with inflammatory bowel disease in two national data sets from 2016 to 2017. We modeled the association between healthcare utilization and racial and ethnic subpopulations across different age groups using generalized estimating equations adjusted by disease and socioeconomic factors.

Results: Among working-age adults, Black Americans had higher emergency department, hospitalization, and steroid use than White patients, however these differences were attenuated after adjusting for socioeconomic factors. Asian and Hispanic Americans were less likely to receive outpatient gastroenterological care and medical therapy even after adjustment. Emergency department use was more likely among elderly Black patients. Hispanic children had increased healthcare utilization for inflammatory bowel disease compared to White children, though these results did not meet statistical significance.

Discussion: Healthcare utilization for long-term management of inflammatory bowel disease is lower in historically marginalized racial and ethnic groups compared to White Americans. Further research is needed to identify and address modifiable patient, clinician, and healthcare system barriers to achieve health equity in the management of inflammatory bowel disease.

Graphical Abstract

Racial Disparities Healthcare Usage for IBD

		Children	Adults 20 - 65	Adults ≥ 65
Patient race compared to White Americans	Asian		Advanced Tx  ED visit 	Steroid use 
	Black	No significant differences in healthcare use	5-ASA use 	Steroid use  ED visit 
	Hispanic		Advanced Tx  GI visit 	Steroid use 

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Keywords

Crohn's disease; ulcerative colitis; healthcare disparities; ethnic and racial minorities

Introduction

Nearly 3 million Americans have been diagnosed with inflammatory bowel diseases (IBD), including Crohn's disease (CD) and ulcerative colitis (UC).¹ These chronic relapsing diseases are characterized by heterogeneity in presentation and course. Most patients require regular monitoring and long-term treatment with medications. While there is no cure, medical and surgical advances in the last several decades have dramatically improved the quality of life for patients with IBD.

Although IBD is more prevalent in White Americans than in Asian, Black and Hispanic individuals,^{1,2} Black and Hispanic Americans have greater difficulty accessing IBD care and are more likely to use emergency department services.³⁻⁵ However, these conclusions are derived from single center studies relying on small samples or populations with varying health insurance coverage. The objective of this study was to compare resource utilization, including medications, office visits, imaging, endoscopy, hospitalization, and surgery, across racial and ethnic groups in the United States (U.S.) among patients with IBD who have commercial or Medicare insurance. Recognizing differences in healthcare utilization across racial and ethnic subpopulations can provide important insight into social and structural disparities in care and identify areas for additional services to achieve health equity in IBD.

Methods

Data source

We conducted a retrospective cohort study utilizing patient-level insurance claims data from Optum's de-identified Clinformatics® Data Mart Database (2000-2018) (CDM) and Medicare (2007-2017). CDM includes anonymized data on demographics, diagnoses, procedures, and medications dispensed. Data on providers includes clinical specialty and subspecialty, and whether healthcare services are provided by an individual provider or a

medical facility. Medicare is a government-run health insurance plan for older (age >65 years) and disabled Americans. CDM data includes patients with managed care Medicare plans. We also used a 20% random sample of national fee for service Medicare data from 2007 to 2017. Medicare benefits are available in three separate plans. Part A covers inpatient care, part B covers outpatient care and part D includes pharmacy benefits. There is no overlap between CDM and Medicare data.

Inclusion and exclusion criteria

We included patients enrolled in the health plan on January 1, 2016 and who had a prevalent diagnosis of IBD prior to and remained enrolled on January 1, 2017. Prevalent diagnosis of IBD was based on our algorithm previously validated in the commercial healthcare population, which uses a combination of diagnoses and prescriptions for IBD therapies with positive predictive values ranging from 78% - 94% depending on diagnoses and prescriptions combinations.⁶ We excluded patients with missing race data, coverage gaps of more than 30 days in 2016, or with one or more diagnosis of psoriasis, psoriatic arthritis, rheumatoid arthritis, multiple sclerosis or ankylosing spondylitis prior to January 1, 2017. This was done to minimize missing data, lower the risk of misclassification, and increase certainty that prescriptions were for treatment of IBD. Medicare beneficiaries were required to have Parts A, B and D coverage on January 1, 2017. Patients exclusively categorized as a race or ethnicity other than Asian, Black, Hispanic or White, including Native American or Alaskan Native, were excluded.

Primary exposure

The primary exposure was a composite variable consisting of race and ethnicity. This was chosen because CDM and Medicare similarly classify race and ethnicity as a single composite variable consisting of Asian, Black, Hispanic, White and Other categories. CDM race classification is from a proprietary algorithm based on geography and name. Medicare race classification uses enrollment information, Social Security, and a proprietary race imputation algorithm. The “Other” category was not included in the study due to heterogeneity. Given race and ethnicity are categorized as a single variable, “race” will hereafter refer to both “race and ethnicity” for clarity. Moreover, for the purpose of this research, race and ethnicity are recognized as social constructs rather than biological clades.

Measures of healthcare utilization

We measured healthcare utilization during 2017 using medications dispensed, outpatient encounters, emergency department encounters, hospitalizations, surgeries, lower endoscopy and cross-sectional imaging (Table 1).

Covariates

Patients were categorized as CD, UC or IBD not otherwise specified (IBDnos) as in our prior research.¹ To be categorized as CD or UC, the majority of the IBD diagnoses and the most recent diagnosis before January 1, 2017 had to be CD or UC, respectively. All other patients were categorized as IBDnos. We collected data on covariates that were hypothesized *a priori* to be associated with race and measures of healthcare utilization. These were

measured in 2016 and included age, sex or gender as recoded in the data, geographic region of residence (Midwest, Northeast, South, West U.S.), number of Elixhauser comorbidities, number of non-IBD medications, number of non-gastroenterology office visits, estimated household income (in CDM only) and dual Medicare and Medicaid eligibility (in Medicare only).⁷ Socioeconomic risk adjustment used household income and dual Medicare and Medicaid eligibility as previously described.⁸ We also captured whether patients had a documented outpatient gastroenterology visit in 2016.

Statistical analysis

All analyses were performed for separately for children (age <20 years), adults aged 20-64 years, and adults aged 65 or older.

Descriptive statistics were used to compare characteristics and healthcare utilization by race. Statistical comparisons used chi-squared test for categorical variables and analysis of variance (ANOVA) for continuous variables. To formally test the association between race and healthcare utilization, we used generalized estimating equations to compute odds ratios (OR) and 95% confidence intervals (CI) clustered on the last gastroenterology provider seen in 2013 to 2016. If no gastroenterology outpatient encounter existed during this period, a unique pseudo-provider was assigned to the patient to maintain consistent clustering in the regression model. Race was included as a categorical variable with non-Hispanic White as the reference group because that group had the most individuals, which increased comparison stability. All models also included number of days of insurance coverage in 2017 to account for variable duration of follow-up.

We constructed statistical models in a stepwise fashion to assess for potential mediating covariates for both data sets. We started with models adjusted only for age, sex and IBD type as covariates. Second, we added geographic region of residence. Third, we added number of Elixhauser comorbidities, number of non-IBD medications, and non-gastroenterology office visits. The fourth iteration included household income categorized as <\$50,000 per year, \$50,000-\$99,999, >\$100,000 and missing within CDM, or dual Medicare and Medicaid eligibility for fee for service Medicare beneficiaries as a surrogate for socioeconomic status.⁹ The final *a priori* model added the number of gastroenterology visits in 2016. Additionally, we created a *post hoc* model to adjust for oral steroid, immunomodulator and advanced IBD therapy (e.g. biologics or JAK inhibitor) use in 2016 to account for disease severity. We qualitatively compared the strength of association in sequential models to identify covariates that were confounding or mediating the association of race with outcomes. Models were not implemented for healthcare utilization categories when any race category had fewer than 5 beneficiaries with utilization of the resource. Within Medicare, the IBDnos group was only included in analysis of use of advanced therapies, imaging and bowel resection surgery as small numbers prevented model convergence for other healthcare utilization outcomes when IBDnos was included. To aggregate data for those age 65 or older, we used fixed effects meta-analysis methods using the most adjusted models.

We report nominal *p* values for all comparisons and applied a correction for multiple testing. Because we made an *a priori* assumption to do all analyses stratified by age and have multiple racial groups, we used a false discovery rate (FDR) to determine significance.¹⁰

The FDR was applied separately to each age group and only to the models with the most covariates. We used an FDR less than 10% and a nominal p value less than 0.05 to define statistical significance.

Statistical power was estimated for the smallest possible groups that could be included in comparisons given the requirement for a minimum of 5 people with the healthcare utilization outcome. Power calculations assumed at least a 10:1 ratio of White patients to the smallest racial group. With 50 patients of whom five (10%) or 100 patients of whom five (5%) had the healthcare utilization outcome, we have 80% power to detect a relative risk of 2.4 and 2.5, respectively, before correcting for multiple comparisons.

Results

The study population included 47,301 patients from CDM (19,332 CD, 26,130 UC, and 1,839 IBDnos) and 34,873 from Medicare (11,802 CD, 21,860 UC, and 1,211 IBDnos). In CDM, 3% were Asian, 8% were Black, 7% Hispanic, and 82% were White. In Medicare, the racial distribution was 2% Asian, 5% Black, 4% Hispanic, and 89% White. All covariates generally varied by race in the CDM and Medicare population (Tables 2 and 3). Notable differences included a larger proportion of patients with UC among Asian and Hispanic patients, a larger proportion of Black beneficiaries living in the Southern U.S., lower household income among Black and Hispanic beneficiaries in CDM, and a higher proportion Medicaid eligibility among Asian, Black, and Hispanic Medicare participants.

Association of race with healthcare utilization in children

Unadjusted rates of healthcare utilization are reported in Supplemental Table 1. Hispanic children were more likely to have undergone lower endoscopy (OR 1.61, 95% CI 1.04-2.49, FDR 0.239) and imaging (1.70, 95% CI 1.03-2.82, FDR 0.239) compared to non-Hispanic White children (Figure 1 and Supplemental Table 2). Steroid usage (1.53, 95% CI 0.99-2.37) and having a gastroenterologist visit (1.62, 95% CI 0.97-2.72) were only nominally higher in Hispanic children. In contrast, Asian (0.50, 95% CI 0.27-0.92, FDR 0.239) and Black children (0.63, 95% CI 0.37-1.07, FDR 0.239) were less likely than non-Hispanic White children to have seen a gastroenterologist. *Post hoc* analysis adjusted for IBD therapies in the year prior showed less use of advanced IBD therapy among Asian children and nominally lower use among Black and Hispanic pediatric patients (Supplemental Table 2). Notably, none of these findings reached the set FDR threshold. In general, the nominally significant associations among children increased in strength with each additional *a priori* adjustment of the regression models among Hispanic children, but not Black or Asian children (Supplemental Table 2).

Association of race with healthcare utilization in adults aged 20 to 65 years old

Black Americans demonstrated a higher steroid, hospitalization, and emergency department use in minimally adjusted analyses, but these associations were attenuated in models that accounted for socioeconomic risks (Figure 2). Use of 5-aminosalicylates (5-ASA) was lower only in Black adults (0.86, 95% CI 0.78-0.96, FDR 0.031) compared to White subjects. Asian Americans had a less use of advanced therapies (0.69, 95% CI 0.57-0.83,

FDR 0.001) but higher use of intravenous iron (1.94, 95% CI 1.28-2.93, FDR 0.013). Hispanic Americans used less advanced therapies (0.74, 95% CI 0.65-0.84, FDR <0.001), less steroids (0.88, 95% CI 0.79-0.98, FDR 0.098), and were less likely to have seen a gastroenterologist (0.84, 95% CI 0.76-0.94, FDR 0.013). Hispanic adults also had a numerically lower likelihood of undergoing lower endoscopy (0.88, 95% CI 0.79-0.99, FDR 0.116) and increased likelihood receive intravenous iron (1.41, 95% CI 1.02-1.96, FDR 0.135), though neither achieved the FDR cutoff of 10%. In contrast to children, the strength of associations among adults under age 65 generally were attenuated by adding additional covariates to the regression models (Supplemental Table 3).

Association of race with healthcare utilization in adults older than age 65 years

Figure 3 and Supplemental Table 4 summarize the analyses evaluating the association between race and healthcare utilization in adults over 65. Older Asian Americans had decreased use of advanced IBD therapies (0.59, 95% CI 0.38-0.92, FDR 0.112), immunomodulators (0.67, 95% CI 0.48-0.93, FDR 0.112), steroids (0.62, 95% CI 0.45-0.86, FDR 0.032) and gastroenterology office visits (0.85, 95% CI 0.73-0.99, FDR 0.139) compared to White adults over 65. Black adults had lower use of steroids (0.77, 95% CI 0.70-0.85, FDR <0.001) and higher use of emergency department care (1.41, 95% CI 1.19-1.67, FDR 0.001). Healthcare use was also lower in older Hispanics with IBD with decreased use of glucocorticoids (0.75, 95% CI 0.67-0.84, FDR <0.001). Significant associations in advanced IBD therapy usage among Hispanic adults and gastroenterology visits across all racial groups disappeared after accounting for household income or dual Medicare and Medicaid eligibility. In the *post hoc* analysis, older black adults also demonstrated a significantly lower advanced IBD therapy use after adjustment for IBD treatment in the prior year. All other healthcare use metrics were not significantly affected by this analysis (Supplemental Table 4).

Discussion

This study leveraged two national administrative databases to generate one of the largest cohorts in the U.S. evaluating the relationship of race with healthcare utilization in adults and children with IBD. We identified variations in care across racial groups of Americans affected by IBD despite no known pathological differences between these populations. Relative to White Americans, Asian and Hispanic adults use fewer healthcare resources for IBD management. In contrast, there were no consistent differences in treatment patterns across age groups when comparing Black and White Americans, although Black Medicare-eligible beneficiaries were more likely to use the emergency department for IBD-related issues. These observations may be due to factors not readily captured by administrative claims data, such as provider practice, healthcare system access and accessibility, and structural racism.

We observed that Hispanic patients under the age of 20 were more likely to undergo diagnostic endoscopy, imaging, and receive glucocorticoids for IBD compared to White children. However, there were no significant differences in healthcare utilization in Black and Asian children compared to White pediatric patients. While these findings did not

achieve statistical significance and are limited in precision by small sample size, they are useful for hypothesis generation. Greater use of steroids, endoscopy, imaging and office visits all suggest more complex disease in Hispanic children, yet they were no more likely to receive advanced therapies than White children. Whether these differences in care are mediated by the provider, the parents, or some other unmeasured factor needs further study. Previously, we did not observe variation in rates of advanced therapy usage among newly diagnosed children based on the treating provider's degree of IBD specialization, nor did we find disparities in likelihood of being seen by a more specialized IBD provider according to race.¹¹ This suggests that factors other than the provider contribute to these differences.

Working-age Black Americans were more likely to receive steroids, use emergency services, and require hospitalization for IBD than White adults. These differences, however, disappeared after adjusting for location, comorbid disease burden, household income, and number of specialist visits. This underscores how social drivers of health intersect to mediate or moderate healthcare disparities. Interestingly, there was no difference in utilization of advanced therapies between Black and White patients in this age group. Previously we demonstrated that among adults newly diagnosed with IBD, time to initiation of biologic therapy was associated with the degree of sub-specialization of the treating gastroenterologist even after adjusting for race and ethnicity.¹¹ While the dataset used in our study does not explicitly capture disease severity, this discordance may imply a threshold effect that once a critical degree of illness is reached, access to advanced IBD therapies does not differ by race in the U.S.

Working-age Asian and Hispanic Americans demonstrated a lower likelihood of healthcare utilization for chronic management of IBD compared to Black or White individuals across all models. Reasons for this health disparity pattern are unclear and may be affected by factors not captured by administrative claims data. One possible influence is the U.S. immigrant experience of first and early generation Asian and Hispanic Americans. Nearly 70% of immigrants to the U.S. identify as Asian or Hispanic American, and almost 80% originate from Latin American or Asian countries.¹² In addition to financial hardship, many U.S. immigrants report language barriers and discrimination in the workplace and community.¹³ The intersectional nature of these challenges may account for the lower rates of healthcare access and utilization previously reported in foreign-born Asian and Hispanic Americans.¹⁴⁻¹⁸ Furthermore, immigrants with IBD often face greater stigmatization of bowel diseases, leading to increased acceptance of complementary and alternative medicines that can divert immigrant patients away from conventional medical therapy.¹⁹⁻²¹ While our study does not capture immigrant status nor country of origin, this may contribute partly to the observed association and merits further study.

Among those older than 65, Black, but not Asian or Hispanic, patients were more likely to receive emergency care for IBD in our fully adjusted models. However, for several measures of healthcare utilization, the strength of association was attenuated after accounting for household income or dual Medicare and Medicaid eligibility. Reasons for this may be due to unique barriers to care rooted in structural and institutional racism. Prior work has shown that older Black Americans with IBD living in the Southern U.S. are disproportionately burdened with low health literacy, which has been associated with greater use of emergency

care and poorer overall health status in the general population.²² Additionally, older Americans with IBD have approximately 50% higher expenses attributable to IBD compared to younger adults and are vulnerable to high out of pocket costs for advanced IBD therapies, especially Medicare part D subscribers.^{23,24} We present real world and exploratory evidence showing how social drivers of health may impede the care of older Black Americans with IBD at a national level.

This work uses a nationally representative sample of patients with IBD across multiple stages of life to assess and identify racial disparities in IBD-related healthcare. We mitigated the risk of misclassification by using a validated algorithm to accurately capture patients with IBD in both the CDM and Medicare cohort. Our results are consistent with existing research and support qualitative studies that report on increased care barriers among marginalized racial groups.^{3-5,22,24,25} By using step-wise models adjusted for sociodemographic covariables, we highlight how these drivers may explain racial health disparities. Finally, we used an adaptive approach to control the FDR while evaluating healthcare utilization across multiple racial groups allowing for greater statistical power, though we may have missed weaker associations using a strict cutoff of 10% to achieve statistical significance.

Our study has some limitations. CDM collects race data using a proprietary algorithm based on patient geography and name, and Medicare sources its data from the Social Security Administration and classifies patients based on language, state, and last name.²⁶ Increases in racial diversity within geographic areas may increase misclassification bias when using such algorithms.²⁷ Increasing algorithm transparency and facilitating self-identification can help increase the validity of demographic variables in large datasets. We also did not capture Medicaid beneficiaries among patients under 65 from historically marginalized populations. Thus, we may underestimate the magnitude of disparities in healthcare utilization among people who have other insurance plans or are uninsured. Finally, our analysis is restricted to a single year and may not accurately reflect the evolving landscape in healthcare coverage. Future research at multiple time points will be helpful to assess how policy changes such as the Affordable Care Act have influenced care delivery for IBD at a national level.

Our study illustrates that healthcare utilization disparities exist among different racial groups and across multiple age generations in Americans affected by IBD. These differences disappear after adjusting for socioeconomic drivers, except in Asian and Hispanic adults, suggesting other factors influence IBD care among these groups in the U.S. These findings underscore the need for efforts to improve access and quality of IBD care for historically marginalized populations. Further research is needed to inform future healthcare and policy interventions that eliminate racial disparities and achieve health equity among all patients with IBD.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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What Is Known

- Patients with inflammatory bowel disease can lead active lives with access to best practice care.
- Historically marginalized groups report barriers in accessing and navigating the U.S. healthcare system.
- The influence of race, ethnicity and age on national healthcare utilization in Americans living with inflammatory bowel disease remains unclear.

What Is New Here

- Working-age Asian and Hispanic Americans with inflammatory bowel disease use standard medical therapy less than White Americans.
- Before adjusting for social drivers, working-age Black Americans use steroids and acute care services more than White Americans.
- Black Americans over 65 use emergency department services more than White Americans to manage inflammatory bowel disease.
- National trends in healthcare usage among children with inflammatory bowel disease across multiple racial and ethnic groups are recorded.

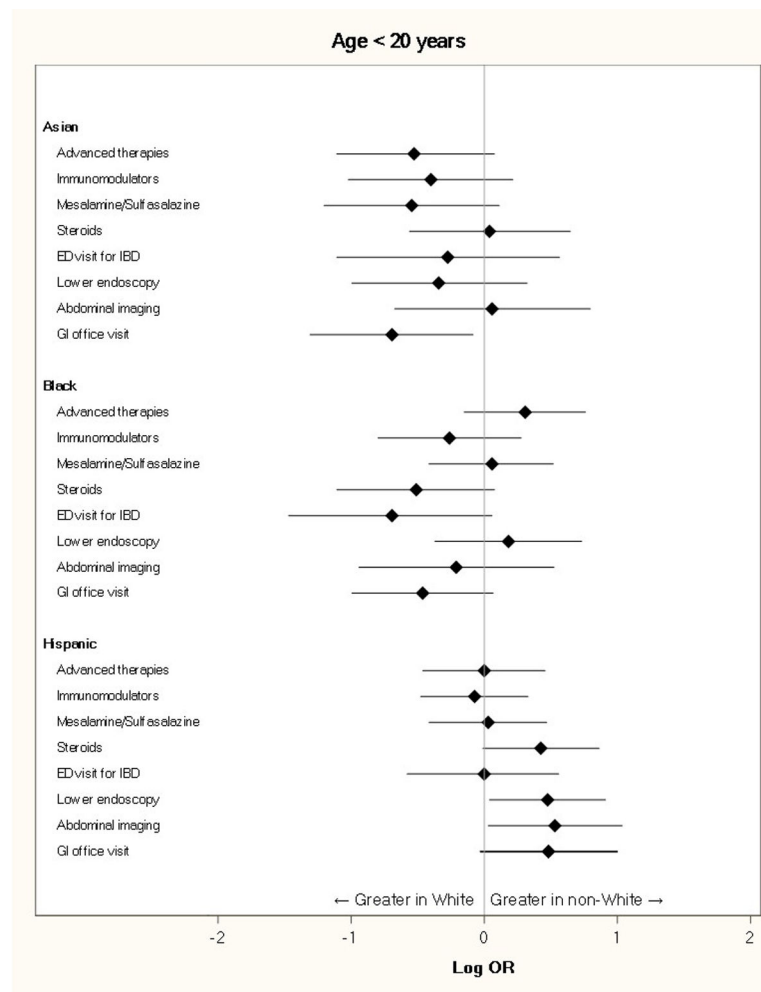


Figure 1: Association of race and ethnicity with healthcare use in children with inflammatory bowel disease aged under 20 years old

Adjusted for age, sex, inflammatory bowel disease type, days of insurance coverage in 2017, region, comorbidities, non-IBD medications, non-gastroenterology office visits, household income, and gastroenterology office visits in 2016.

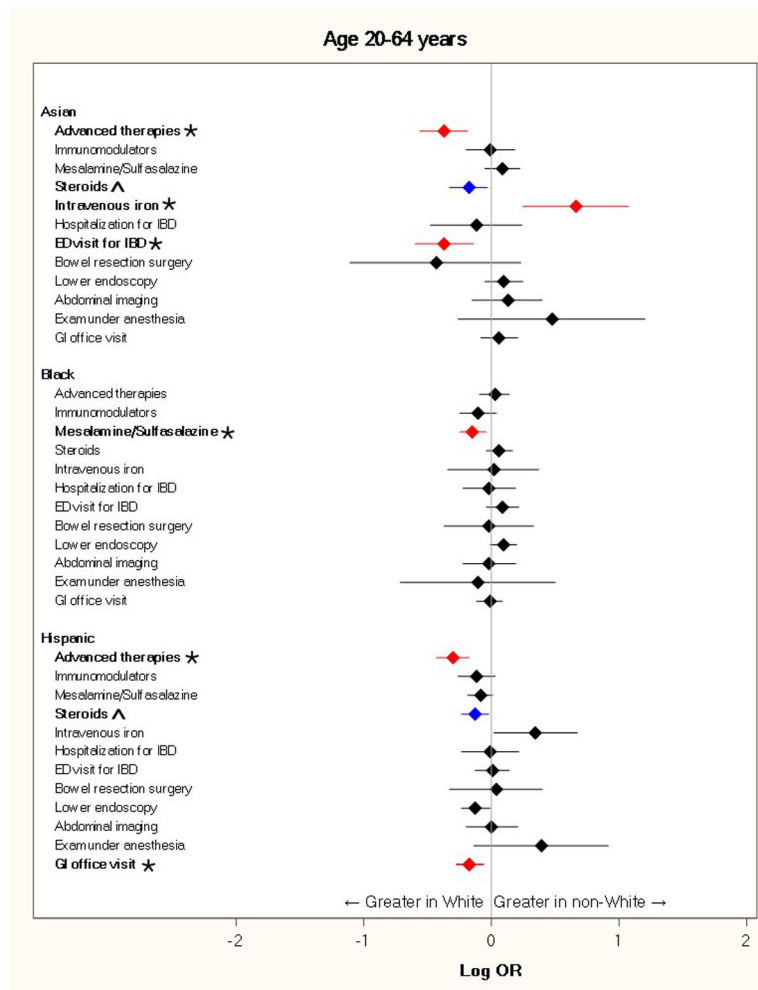


Figure 2: Association of race and ethnicity with healthcare use in adults with inflammatory bowel disease aged 20 to 64 years

Adjusted for age, sex, inflammatory bowel disease type, days of insurance coverage in 2017, region, comorbidities, non-IBD medications, non-gastroenterology office visits, household income, and gastroenterology office visits in 2016.

* FDR = 0.05-0.09

^ FDR < 0.05

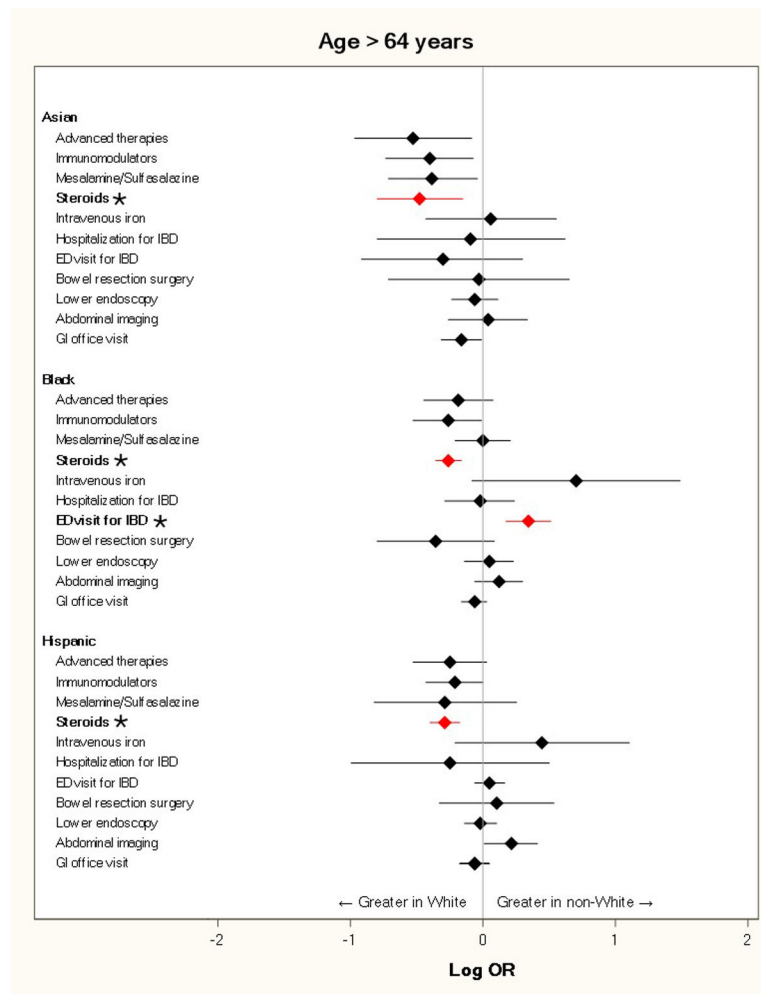


Figure 3: Association of race and ethnicity with healthcare use in adults with inflammatory bowel disease over 64 years old (CDM and Medicare fee-for-service pooled)
 Adjusted for age, sex, inflammatory bowel disease type, days of insurance coverage in 2017, region, comorbidities, non-IBD medications, non-gastroenterology office visits, household income, and gastroenterology office visits in 2016.

^ FDR < 0.05

Table 1.

Healthcare utilization measures

Healthcare utilization	Definition	Notes
Mesalamine use	≥1 dispensing of mesalamine or sulfasalazine	
Advanced medications for IBD	≥1 dispensing of infliximab, adalimumab, certolizumab, ustekinumab, vedolizumab or tofacitinib	Tofacitinib only applied to ulcerative colitis
Immunomodulator therapy	≥1 dispensing of azathioprine, mercaptopurine or methotrexate	
Glucocorticoid use	≥1 dispensing of oral glucocorticoids	
Intravenous iron	≥1 dispensing of intravenous iron	
Gastroenterology office visits	≥1 outpatient office visits with a gastroenterologist	
Lower endoscopy	≥1 colonoscopy or sigmoidoscopy	
Cross-sectional imaging	≥1 computed tomography (CT), magnetic resonance imaging (MRI), small bowel follow-through, barium enema	CT or MRI must include abdomen and pelvis or pelvis alone
Emergency department use	≥1 emergency department visit	Must have a primary diagnosis of IBD or related symptom or abdominal imaging
Hospitalization	≥1 hospitalizations	Must have a primary diagnosis of IBD or related symptom
Bowel resection surgery	≥1 procedures to resect a portion of the small bowel or colon	
Exam under anesthesia	≥1 anorectal exam under anesthesia	Includes anoplasty, incision and drainage of ischiorectal or intramural abscess, with fistulectomy or fistulotomy , submuscular, <i>with or without placement of a seton. Does not include removal of seton.</i>

Table 2.
Characteristics of the Clinformatics® Data Mart Database (2000-2018) cohort

Characteristic	Asian	Black	Hispanic	White	P value
Disease type					
Crohn's disease	508 (33.3%)	1,544 (41.5%)	1,170 (33.3%)	16,110 (41.8%)	<.0001
Ulcerative colitis	947 (62.1%)	2,021 (54.4%)	2,169 (61.8%)	20,993 (54.5%)	
IBDnos	69 (4.5%)	153 (4.1%)	170 (4.8%)	1,447 (3.8%)	
Age (mean, SD)	50.5 (18.6)	55.1 (18.2)	53.1 (19.4)	55.3 (18.9)	<.0001
Under 20 years (n,%)	64 (4.2%)	86 (2.3%)	119 (3.4%)	1,148 (3.0%)	<.0001
20 – 64 years (n,%)	1,052 (69.0%)	2,295 (61.7%)	2,261 (64.4%)	23,346 (60.6%)	
65 or older (n,%)	408 (26.8%)	1,337 (36.0%)	1,129 (32.2%)	14,056 (36.5%)	
Female sex (n,%)	662 (43.4%)	2,167 (58.3%)	1,836 (52.3%)	19,833 (51.4%)	<.0001
Region					
Midwest (n,%)	200 (13.1%)	669 (18.0%)	406 (11.6%)	11,375 (29.5%)	<.0001
Northeast (n,%)	316 (20.8%)	318 (8.6%)	466 (13.3%)	4,983 (12.9%)	
South (n,%)	483 (31.7%)	2,454 (66.0%)	1,548 (44.2%)	13,649 (35.4%)	
West (n,%)	523 (34.4%)	276 (7.4%)	1,086 (31.0%)	8,539 (22.2%)	
Comorbidities (mean, SD)	0.3 (1.1)	0.5 (1.7)	0.4 (1.4)	0.4 (1.5)	<.0001
Non-IBD medications (mean, SD)	4.5 (4.8)	6.7 (5.8)	5.7 (5.4)	5.7 (5.4)	<.0001
Non-gastroenterology office visits (mean, SD)	4.7 (5.6)	5.8 (6.1)	5.3 (5.7)	5.5 (5.8)	<.0001
Gastroenterology office visits in 2016 (mean, SD)	1.5 (2.0)	1.4 (1.9)	1.3 (1.8)	1.3 (1.8)	<.0001
Household income					<.0001
Unknown	139 (9.1%)	215 (5.8%)	268 (7.6%)	1,672 (4.3%)	
<\$50,000	202 (13.3%)	1,659 (44.6%)	1,080 (30.8%)	8,057 (20.9%)	
\$50,000-\$99,999	414 (27.2%)	1,189 (32.0%)	1,191 (33.9%)	12,580 (32.6%)	
>\$100,000	769 (50.5%)	655 (17.6%)	970 (27.6%)	16,241 (42.1%)	
Follow-up days in 2017 (mean, SD)	340 (74.2)	341 (71.3)	343 (68.6)	343 (68.2)	0.1387

IBDnos – inflammatory bowel disease not otherwise specified

SD – standard deviation

Table 3.

Characteristics of the Medicare cohort

Characteristic	Asian	Black	Hispanic	White	P value
Disease type					<0.0001
Crohn's disease	250 (30.7%)	564 (34.6%)	394 (28.9%)	10,594 (34.1%)	
Ulcerative colitis	544 (66.8%)	1,020 (62.5%)	935 (68.5%)	19,361 (62.3%)	
IBDnos	20 (2.5%)	48 (2.9%)	35 (2.6%)	1,108 (3.6%)	
Age (mean, SD)	77.5 (7.09)	76.0 (7.42)	76.8 (7.35)	76.3 (7.32)	<0.0001
Female sex (n,%)	485 (59.6%)	1,097 (67.2%)	901 (66.1%)	19,236 (61.9%)	<0.0001
Region					<0.0001
Northeast (n,%)	192 (23.6%)	333 (20.4%)	320 (23.5%)	7,554 (24.3%)	
South (n,%)	216 (26.5%)	885 (54.2%)	440 (32.3%)	11,146 (35.9%)	
Midwest (n,%)	74 (9.1%)	290 (17.8%)	136 (10.0%)	7,298 (23.5%)	
West (n,%)	332 (40.8%)	124 (7.6%)	468 (34.3%)	5,065 (16.3%)	
Comorbidities (mean, SD)	0.8 (2.22)	1.8 (3.33)	1.4 (2.80)	1.0 (2.37)	<0.0001
Non-IBD medications (mean, SD)	10.1 (6.59)	10.6 (6.43)	11.0 (7.02)	9.4 (5.76)	<0.0001
Non-gastroenterology office visits (mean, SD)	8.5 (6.71)	8.2 (6.98)	8.9 (7.72)	8.9 (7.21)	0.0011
Medicare-Medicaid dual eligible	463 (56.9%)	681 (41.7%)	782 (57.3%)	3,538 (11.4%)	<0.0001
Follow-up days in 2017 (mean, SD)	347.0 (66.88)	342.4 (71.76)	341.8 (72.32)	351.8 (55.67)	<0.0001

IBDnos – inflammatory bowel disease not otherwise specified

SD – standard deviation