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Assessing National Trends and Disparities in Ambulatory, Emergency Department, and Inpatient Visits for Inflammatory Bowel Disease in the United States (2005–2016)

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Abstract

Background: Patients with inflammatory bowel diseases (IBD) require repeated healthcare encounters, although the focus of care differs when patients are seen in ambulatory, emergency department (ED), or inpatient settings. We examined contemporary trends and disparities in IBD-related healthcare visits.

Methods: We used data from the National Ambulatory Medical Care Survey, Nationwide Emergency Department Sample, and National Inpatient Sample to estimate the total number of annual IBD-related visits from 2005 through 2016. We performed logistic regression analyses to test temporal linear trends. Slope and differences in distributions of patient demographics were compared across time and treatment settings.

Results: From 2005 through 2016, approximately 2.2 million IBD-related ambulatory visits (95% CI, 1.9–2.5 million IBD-related ambulatory visits) occurred annually on average, increasing by 70.3% from the time period of 2005–2007 through the time period of 2008–2010, and decreasing by 19.8% from the time period of 2011–2013 through the time period of 2014–2016. An average of 115,934 IBD-related ED visits (95% CI, 113,758–118,111 IBD-related ED visits) and 89,111 IBD-related hospital discharges (95% CI, 87,416–90,807 IBD-related hospital discharges) occurred annually. Significant increases in the rate of IBD-related ED visits (3.2 visits/10,000 encounters, $P < .0001$) and hospital discharges (6.0 discharges/10,000 encounters, $P < .0001$) were observed from 2005 through 2016. The proportion of patients paying with private insurance decreased from 2005 through 2016, among all care settings. A greater proportion of young patients, patients with Crohn's disease, non-white patients, and patients with Medicare or Medicaid used hospital-based vs ambulatory services.

Conclusions: In an analysis of data from 3 large databases, we found that although IBD-related ambulatory visits stabilized-to-decreased from 2005 through 2016, rates of ED use and admission

to the hospital have continued to increase with changes in patient demographics, over time and among care settings.

Keywords

NAMCS; NEDS; NIS; ulcerative colitis; Crohn's disease; health care utilization

INTRODUCTION

The management of inflammatory bowel disease (IBD) is associated with substantial healthcare resource utilization and costs.^{1, 2} Patients with IBD are often diagnosed at a young age and the natural history is typically characterized by a relapsing-and-remitting chronic disease course that necessitates repeated healthcare encounters. This burden is anticipated to increase due to rising IBD incidence rates and compounding disease prevalence.^{3, 4} While most therapeutic decisions are made in the ambulatory clinic, many patients with IBD will require care in the emergency department (ED) or admission to hospital due to unexpected disease complications or severe flares. Additionally, the ED or hospital may become a primary point of access for patients without a regular healthcare provider or for subpopulations of patients who have inadequate access to routine ambulatory care.

There are an estimated 3.1 million individuals with IBD in the United States.⁵ Previously, Ananthakrishnan *et al.* demonstrated that ambulatory visits for IBD increased by over 55% and ED visits increased by over 165% from 1994 to 2005.⁶ Since 2005, several important advances in the management of IBD have been achieved. The addition of several classes of effective therapies to the treatment armamentarium along with the adoption of more aggressive treat-to-target management paradigms have improved long-term disease control.^{7, 8} Furthermore, passage of the Patient Protection and Affordable Care Act (ACA) in 2010 has substantially changed the landscape of healthcare coverage in the United States. While a few other studies have examined secular trends in hospitalization, none have comprehensively examined changes in both inpatient and ambulatory care which is essential to provide a comprehensive assessment of changing IBD healthcare epidemiology.

Therefore, we aimed to examine contemporary national-level trends in IBD-related ambulatory visits, ED encounters, and inpatient hospitalizations. Secondary objectives were to identify potential demographic-, disease-, regional-, and payment-related disparities in access to IBD care across treatment settings.

METHODS

Study Design and Data Sources

Data from the National Ambulatory Medical Care Survey (NAMCS), Nationwide Emergency Department Sample (NEDS), and the National Inpatient Sample (NIS) were analyzed to evaluate ambulatory, ED, and inpatient IBD-related visits, respectively, from 2005 to 2016. NAMCS is a publicly available database that uses a multistage, clustered probability technique to sample office-based physicians primarily engaged in direct patient

care. The NAMCS sample contains data collected from >20,000 observations that approximate national-level estimates from almost 1 billion patient visits annually. NEDS and NIS are the largest United States all-payer ED and inpatient databases, respectively. NEDS data are available from 2006 to 2016; ~31 million unweighted ED observations are used to estimate ~143 million visits nationally. The NIS is a discharge database containing data from ~7 million unweighted discharges, approximating more than 35 million hospitalizations nationally.

Study Population and Variables

Patient visits for adults (≥ 18 years) with IBD were identified using the reason for visit diagnosis codes in NAMCS and the primary diagnosis code in NEDS/NIS. Only the primary diagnostic position was included to generate more specific albeit conservative estimates of IBD-related visits and minimize misclassification bias for IBD-unrelated presentations in patients with Crohn's disease (CD) or ulcerative colitis (UC). All diagnostic coding was based on the *International Classification of Diseases* (ICD) 9th or 10th Revision. Diagnostic codes for CD (ICD-9 555, ICD-10 K50.X) and UC (ICD-9 556, ICD-10 K51.X) have been previously validated.^{9, 10}

Patient age, gender, race, primary source of payment, and geographic region were collected for each visit. Data on race was available in NAMCS and NIS. In NAMCS, race was categorized as white versus non-white; this division was chosen to ensure adequate subgroup sample size. In a secondary analysis, we evaluated the relationship between primary payment method and sex, age, and race over time. In NAMCS, physician specialty group was categorized as medical (gastroenterology), surgical (general surgery and colorectal surgery), and primary care specialties (family practice and internal medicine). Medication use was recorded in NAMCS using the Lexicon Plus® Cerner Multum, Inc. database. Drug classes of interest were corticosteroids and immunosuppressants (including both biologics and traditional immunosuppressants).

Statistical Analysis

To generate unbiased national estimates of IBD-related visits, sampling weights were applied. All analyses were conducted adjusting for complex survey design. The total annualized number and rate per 10,000 encounters of IBD-related visits was calculated with 95% confidence intervals (CI). To produce reliable national estimates using NAMCS, the National Center for Health Statistics (NCHS) guidelines require that at least 30 unweighted sample visits in each subgroup be included and the relative standard error (RSE) of weighted estimates be <30%. Variance estimates were made using the Taylor linearization method to reflect the complex sample design. To provide more reliable variance estimates in NAMCS, the study period was grouped into four eras consisting of three consecutive survey years (2005-2007, 2008-2010, 2011-2013, 2014-2016); estimated national projections were divided by three to arrive at annualized numbers. Differences in demographic characteristics were assessed using a design-adjusted Pearson χ^2 test. A logistic regression model was used to test the temporal linear trends based on the slope of era (NAMCS) or year (NEDS/NIS), treated as a continuous variable. Estimates of change between eras/years were performed

using a linear contrast. All analyses were conducted using Stata 15.1 (StataCorp LLC, College Station, TX).

RESULTS

Ambulatory Visits for IBD

From 2005-2016, a total of 940 unweighted observations representing an annual national average of 2.2 million [95% CI: 1.9–2.5 million] IBD-related ambulatory visits were identified. Total annual ambulatory visits increased by 70.3% between Era 1 (2005-2007) and Era 2 (2008-2010) (1.5 million/year [95% CI: 1.0–2.1 million/year] to 2.6 million/year [95% CI: 1.8–3.4 million/year]), then stabilized in Era 3 (2011-2013) (2.6 million/year [95% CI: 1.9–3.2 million/year]) before decreasing by 19.8% in Era 4 (2014-2016) (2.1 million/year [95% CI: 1.4–2.7 million/year]) (Table 1). Trends in IBD-related ambulatory visits were primarily driven by CD-related encounters (Figure 1), which comprised the majority of ambulatory visits in Eras 1-3. However, in 2014-2016, UC-related visits (58.8%, RSE 9.3%) became more frequent than CD-related visits (41.2%, RSE 13.3%) for the first time. UC-related visits increased by 156% from 473,000 [95% CI: 235,000–712,000] annual visits in 2005-2007 to 1.2 million [95% CI: 747,000–1,678,000] annual visits in 2014-2016 ($p=0.002$). Data on corticosteroid and immunosuppressant use from 2005-2007 were suppressed due to unreliable estimates ($RSE>30\%$). The proportion of patients prescribed a corticosteroid was relatively stable between 2008-2010 (15.5%, RSE 25.9%) and 2014-2016 (18.4%, RSE 23.1%) ($p=0.61$). Similarly, the proportion of patients prescribed either a biologic or traditional immunosuppressant was stable between 2008-2010 (22.7%, RSE 20.4%) and 2014-2016 (18.1%, RSE 22.1%) ($p=0.97$).

The demographic distribution of IBD patients accessing ambulatory care is summarized in Table 2. Most visits were by women, patients ≥ 40 years, patients of white race, and those with private insurance. The proportion of ambulatory visits among patients ≥ 60 years increased from 22.4% (RSE 19.5%) in 2005-2007 to 39.4% (RSE 8.9%) in 2014-2016 ($p=0.02$). Similarly, the proportion of patients paying with private insurance trended downwards from 65.6% (RSE 9.8%) in 2005-2007 to 44.9% (RSE 16.5%) in 2014-2016 ($p=0.07$). The proportion of patients seen by a medical specialist (range 51.0%–64.0%) as compared to primary care specialist (range 28.3%–36.8%) was stable during the study period ($p=0.31$).

ED Utilization for IBD

From 2006-2016, a total of 283,353 unweighted observations representing an annual national average of 115,934 [95% CI: 113,758–118,111] IBD-related ED visits were identified. Approximately twice as many ED visits were related to CD compared to UC. A significant increase in the annual number of IBD-related ED encounters occurred during the study period, increasing from 86,347 [95% CI: 81,557–91,138] visits in 2006 to 143,987 [95% CI: 133,623–154,351] visits in 2016 ($p<0.0001$), with an absolute increase in visit rate of 3.2 visits/10,000 encounters [95% CI: 2.6–3.8] (Figure 1). From 2006-2016, the rate of both CD-related ED visits (6.4–8.3 visits/10,000 encounters) and UC-related ED visits (2.8–4.2 visits/10,000 encounters) increased significantly ($p<0.0001$ for both).

Gender and age demographic distributions and regional utilization of ED services for IBD were stable over time (Table 2). However, temporal changes in primary payment method occurred: the proportion of patients on Medicaid increased from 14.0% (RSE 3.8%) in 2006 to 24.3% (RSE 2.6%) in 2016 ($p<0.0001$), while the proportion of patients with private insurance decreased from 47.3% (RSE 1.8%) in 2006 to 40.7% (RSE 1.7%) in 2016 ($p<0.0001$).

Inpatient Hospitalizations for IBD

From 2005-2016, a total of 220,299 unweighted observations representing an annual national average of 89,111 [95% CI: 87,416–90,807] IBD-related discharges were identified. Approximately twice as many discharges were CD-related compared to UC-related. A significant increase in the annual number of IBD-related discharges occurred during the study period, increasing from 79,939 [95% CI: 74,093–85,785] in 2005 to 95,960 [95% CI: 92,230–99,690] in 2016 ($p<0.0001$), with an absolute increase in visit rate of 6.0 discharges/10,000 encounters [95% CI: 4.3–7.7] (Figure 1). From 2005-2016, the rate of both CD-related hospital discharges (16.2–20.0 discharges/10,000 encounters) and UC-related discharges (9.6–11.8 discharges/10,000 encounters) increased significantly ($p<0.0001$ for both). Direct IBD-related hospitalization charges in 2016 totaled \$4.12 billion US dollars [95% CI: 3.85, 4.39].

Significant changes in the demographic characteristics of patients accessing IBD-related inpatient care occurred during the study period. A slight but significant decrease in the proportion of female patients occurred (from 56.2% [RSE 0.9%] in 2005 to 53.2% [RSE 0.7%] in 2016, $p<0.0001$), and a significant increase in the proportion of black patients accessing inpatient care occurred (from 9.8% [RSE 6.6%] in 2005 to 14.3% [RSE 2.8%] in 2016, $p<0.0001$). There was a significant decrease in private insurance (from 54.7% [RSE 1.7%] in 2005 to 46.7% [RSE 1.2%] in 2016, $p<0.0001$) and increase in Medicaid (10.3% [RSE 4.6%] in 2005 to 19.5% [RSE 2.0%] in 2016, $p<0.0001$). This pattern was observed in both CD and UC. When comparing the most recent demographic data (2014-2016) for patients presenting to ED or inpatient care compared to ambulatory visits, a higher proportion of younger patients <40 years (range 45.2%–53.6% vs. 15.1%), males (44.3%–46.8% vs. 36.8%), patients with CD (62.3%–67.8% vs. 41.2%), and non-whites (26.2%–26.6% vs. 20.0%) presented for acute care services.

Relationship between Payment Method and Demographic Characteristics

Changes in primary method of payment in relation to age, sex, and race are presented in Supplemental Table 1. Males and females presenting to hospital or ED have similar rates of private insurance, but men are more likely to pay by other means (including self-pay). Black inpatients are less likely to be covered by private insurance. There has been an increase in public payment over time, particularly among elderly patients 60 years across all settings.

DISCUSSION

In this analysis of three large national databases over a 12-year study period, we evaluated contemporary trends in ambulatory, ED, and inpatient visits for IBD in the United States.

While outpatient visits increased from 2005 to 2010, these rates plateaued-to-decreased between 2011 and 2016, a trend primarily driven by reductions in ambulatory visits for CD. This contrasts with continued rising rates of both ED and inpatient IBD-related care. The demographic distribution of patients accessing each modality of care were also different: the proportion of patients paying with private insurance declined over time, and disproportionately greater representation of young, male, CD, and non-white patients presented to acute hospital-based ED or inpatient settings.

Importantly, this study was designed to measure trends in IBD care delivery across multiple treatment settings in the US by using nationwide administrative data. Although this design allowed determination of national-level estimates, it is important to acknowledge that we are unable to directly evaluate the causative factors influencing healthcare utilization. The level of observation is the patient visit rather than individual patient data (all data is anonymized and de-identified), and analyses are cross-sectional rather than longitudinal in nature. Additionally, these datasets broadly capture healthcare utilization but are not IBD-specific; therefore, important characteristics of the disease (e.g. phenotype, location, duration, and activity) and management (treatment target, monitoring algorithm, medication exposure, treatment timing, dosing, etc.) are unavailable.

Recognizing these limitations, we hypothesize that the observed differences in ambulatory, ED, and inpatient trends are likely to be multifactorial. Plateauing of ambulatory visit rates may reflect changes in IBD practice patterns, including: 1) increased use of biologic therapy¹¹; 2) shifts in therapeutic goals towards endoscopic remission⁸; 3) closer non-invasive monitoring of inflammatory burden¹²; 4) adoption of patient-centered healthcare delivery models by telehealth, e-medicine, and IBD nurse specialists¹³; and 5) implementation of more aggressive management strategies that emphasize earlier introduction of effective treatments and combination therapy for achieving therapeutic targets.^{7, 14} Collectively, these interventions may have resulted in better overall disease control, although our study is not specifically designed to determine etiological factors leading to changes in IBD-related visits.

Despite these advances, we observed rising rates of ED and inpatient hospitalizations for IBD, which parallels findings by other authors.^{6, 15, 16} Younger patients, patients with CD, males, non-whites, and patients without private insurance are disproportionately represented in hospital-based compared to ambulatory care, a trend that has persisted from previous evaluations in the 1990s and early 2000s using this dataset.⁶ While this may reflect incident cases that require higher initial resource utilization, it also raises concerns about inequity of access to outpatient care in these subgroups. Not only are patients with complicated disease and inconsistent follow-up at highest risk for adverse outcomes, but those patients with limited financial means are also the most susceptible to costs associated with repeated outpatient visits and bear the greatest burden of other negative socioeconomic determinants of health.

Imbalanced access to ambulatory versus ED or hospital-based treatment has important implications for both patient care and resource utilization. The fundamental types of care delivered in ambulatory and hospital-based settings are different. While ED and inpatient

treatment focus on managing acute disease flares or disease-related complications, there is less emphasis on chronic disease maintenance. Consequently, inadequate optimization of medical therapy for their CD and UC may result in suboptimal disease control and frequent unplanned healthcare visits for relapses. In addition, patients without routine outpatient follow-up may miss opportunities to optimize preventative health measures such as age-appropriate and disease-specific vaccinations, screening for anxiety depression, and osteoporosis, smoking cessation counseling, and colorectal and cervical cancer screening.¹⁷ From a health systems perspective, accessing hospital-based services is also costlier than ambulatory visits: an estimated 30%-40% of total direct IBD treatment costs are related to hospitalizations alone and we anticipate this burden to grow given increasing temporal trends in IBD-related ED visits and discharges.¹⁸⁻²⁰

We also evaluated temporal changes in patient characteristics over time. We observed decreasing proportions of private insurance and increasing proportions of patients on Medicaid during the study period that may reflect increasing reliance on government healthcare due to inaccessibility or unaffordability of other modes of insurance. Generally, a greater proportion of female patients accessed ambulatory care services compared to males. In addition to gender-related differences in care attitudes, differences in insurance coverage may also play a role as males are more likely to pay by other means (including self-pay) that financially discourage routine follow-up and favor accessing emergent on-demand care only when needed. Changes in the primary method of payment over time may also reflect expansion of Medicaid through the ACA. Given regional heterogeneity and state-level differences in ACA uptake, implementation of major ACA provisions in 2014, and the ongoing dynamically shifting landscape of healthcare coverage in the United States, the impact of these social reforms is unlikely to have yet been fully appreciated.²¹ Finally, we observed a substantial expansion in the elderly IBD subgroup, for whom there are specific management considerations including treatment of non-IBD-related comorbidities, increased susceptibility to infections and malignancy, risk of polypharmacy, and evaluation of both “chronological” and “biological” age and frailty.²²

It is important to consider how our study design may have affected observed IBD-related visit rates. First, our estimates of ambulatory visits are almost certainly conservative. As IBD management become increasingly complex, a greater proportion of patients, particularly with CD, may be managed by IBD subspecialists or in IBD centers of excellence.^{23, 24} These subspecialized referral settings are likely to be under-sampled in NAMCS, as indicated by the relatively low proportion of patients on immunosuppressant or biologic therapy, which also does not include hospital-based outpatient clinics. As there were fewer observations associated with biologic/immunosuppressant use, the corresponding RSE is higher than for other estimates; this reflects less precision in the estimate but does not inaccuracy in the estimate itself. Second, IBD patients may receive care in other outpatient settings not captured in NAMCS such as ambulatory infusion clinics or endoscopy centers.

We also considered the potential impact of administrative coding changes on observed trends. Importantly, all three datasets transitioned from ICD-9 to ICD-10 during the study period although this is unlikely to have made a significant difference in our results. The coding structure for both CD and UC remained similar with this change, with ICD-9 555

mapping to K50.X (CD) and 556 mapping to K51.X (UC). In 2016, NAMCS introduced an alternative mode of data collection involving direct submission of electronic health records. In an assessment of data anomalies between 2015 and 2016, the percentage of visits for certain chronic conditions, including arthritis and diabetes decreased ~5%.²⁵ It remains unclear if these changes are attributable to data collection versus real-world treatment patterns. Finally, there is an apparent abrupt increase in IBD-related discharges from 2007-2008, primarily for CD. Although no design or sample frame changes to the NIS occurred in 2008, this may reflect the addition of Pennsylvania and Louisiana to the NIS that year (6th and 25th most populous states, respectively).

Our study has several strengths. We evaluated multiple distinct healthcare settings to extrapolate the overall burden of IBD in the United States and the use of national all-payer data allows estimation of generalizable figures. Additionally, we were able to evaluate differences in patient subgroups accessing care, both across treatment settings and over time. These findings have important implications for the future optimization of IBD care on a population level. First, given the increasing utilization of healthcare resources by elderly patients, improving our understanding of the long-term efficacy and safety of therapies in this subgroup and the training of geriatric-focused IBD specialists are system priorities. Second, we hypothesize that suboptimal disease control, both of inflammatory activity and disease-related comorbidities such as anxiety/depression, are likely to be contributing to the continued rise in acute care visits for IBD. Potentially, the adoption of patient-centered IBD medical homes that are capable of handling the complex behavioral, preventive, and therapeutic care requirements in these patients may reduce long-term healthcare resource utilization.²⁶

However, our study also has some important limitations. First, we are unable to adjust for changes in disease prevalence. However, we analyzed rates of IBD-related encounters relative to all clinical presentations, accounting for the increased rate of healthcare utilization in the general population during the study period. Second, as discussed previously, we used anonymized visit-level rather than identifiable patient-level data. This precludes evaluation of individual per-patient healthcare resource utilization or tracking visits across time, as most IBD-related costs are spent on the minority of patients with high-risk aggressive disease. Third, while we have described national-level trends in IBD-related visits, this study should not be used to infer the determinants of temporal changes in healthcare resource utilization. However, we believe that our findings should be used to support a call for action towards advancing health policy objectives for patients with IBD in the US: these include eliminating barriers for accessing care in disadvantaged or vulnerable patient subgroups and improving access to urgent IBD care with an aim towards reducing IBD-related ED visits and hospitalizations.

In conclusion, we demonstrate that there has been a recent plateauing of ambulatory IBD-related visits while ED and inpatient visits continue to increase. Furthermore, there continues to be disproportionate representation of young, CD, male, non-white patients without private insurance presenting to acute hospital-based care, although over time, there has been a shift towards increasing Medicaid coverage among IBD patients. Further research

examining the impact of disease-related factors on temporal resource utilization and the effect of changing patient populations on long-term treatment outcomes is required.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Abbreviations:

ACA	Affordable Care Act
CD	Crohn's disease
CI	confidence interval
ED	emergency department
IBD	inflammatory bowel disease
ICD	International Classification of Diseases
NAMCS	National Ambulatory Medical Care Survey
NCHS	National Center for Health Statistics
NEDS	Nationwide Emergency Department Sample
NIS	National Inpatient Sample
RSE	relative standard error
UC	ulcerative colitis

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Need to Know

Background: Patients with inflammatory bowel diseases (IBD) require repeated healthcare encounters, although the focus of care differs when patients are seen in ambulatory, emergency department, or inpatient settings. However, little is known about contemporary trends and disparities in IBD-related healthcare visits.

Findings: In an analysis of data from 3 large databases, we found that although IBD-related ambulatory visits stabilized or decreased from 2005 through 2016, emergency department use and hospitalizations have continued to increase with changes in patient demographics, over time and among care settings.

Implications for patient care: Emergency department use and hospitalizations continued to increase for patients with IBD from 2005 through 2016.

Figure 1.

Temporal trends in rates of inflammatory bowel disease-related ambulatory (A-C), emergency department (D-F) and inpatient (G-I) visits in the United States (2005-2016), stratified by disease type.

Table 1.

Total annual weighted estimates of inflammatory bowel disease-related ambulatory, emergency department, and inpatient visits in the United States, 2005-2016.

Total Annual Encounters* n [95% CI]	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Inflammatory Bowel Disease												
Ambulatory visits	1,524,000 [993,000–2,054,000]			2,595,000 [1,777,000–3,413,000]		113,048	114,572	120,634	126,609	132,797	2,061,000 [1,415,000–2,707,000]	
Emergency visits	N/A	86,347 [81,557–91,138]	93,168 [87,467–98,869]	101,722 [95,766–107,678]	103,951 [98,154–109,748]	110,995 [106,101–119,995]	108,242 [102,902–120,902]	122,781 [112,781–128,487]	119,508 [113,711–126,609]	132,797 [123,630–141,964]	138,442 [130,895–145,990]	143,987 [133,623–154,351]
Inpatient visits	79,939 [74,093–85,785]	79,673 [74,200–85,146]	80,132 [74,884–85,380]	92,539 [82,926–102,152]	90,482 [81,381–99,582]	89,920 [83,950–95,890]	94,463 [87,556–101,369]	91,755 [88,207–95,304]	90,500 [87,079–93,921]	91,730 [88,223–95,237]	92,245 [88,607–95,883]	95,960 [92,230–99,690]
Crohn's disease												
Ambulatory visits	1,050,000 [632,000–1,469,000]			1,682,000 [1,075,000–2,288,000]		78,724	78,559	83,416	87,703	89,984	849,000 [526,000–1,172,000]	
Emergency visits	N/A	60,076 [56,509–63,643]	65,149 [60,891–69,407]	70,571 [66,273–74,869]	71,509 [67,234–75,785]	73,571 [73,571–83,876]	73,970 [73,970–83,147]	83,416 [77,651–89,181]	87,703 [82,616–92,791]	89,984 [83,450–96,519]	93,737 [88,310–99,164]	95,838 [88,701–102,974]
Inpatient visits	50,051 [46,252–53,851]	49,354 [45,563–53,146]	49,260 [45,823–52,698]	58,418 [52,122–64,714]	56,949 [51,039–62,858]	57,155 [52,956–61,354]	59,674 [55,032–64,316]	58,455 [56,091–60,820]	55,845 [53,600–58,090]	57,370 [54,992–59,748]	57,435 [54,938–59,932]	60,225 [57,632–62,818]
Ulcerative colitis												
Ambulatory visits	473,000 [235,000–712,000]			913,000 [509,000–1,317,000]		34,324	36,013	37,218	38,906	42,812	1,212,000 [747,000–1,678,000]	
Emergency visits	N/A	26,271 [24,634–27,909]	28,019 [26,142–29,896]	31,152 [29,179–33,124]	32,442 [30,455–34,429]	32,062 [32,062–36,586]	33,795 [33,795–38,231]	34,643 [34,643–39,792]	36,428 [36,428–41,384]	39,631 [39,631–45,994]	44,705 [41,949–47,462]	48,149 [44,306–51,992]
Inpatient visits	29,888 [27,553–32,222]	30,319 [28,312–32,325]	30,872 [28,716–33,028]	34,122 [30,625–37,619]	33,533 [30,088–36,978]	32,765 [30,616–34,913]	34,789 [32,216–37,362]	33,300 [31,811–34,789]	34,655 [33,167–36,143]	34,360 [32,914–35,806]	34,810 [33,341–36,279]	35,735 [34,284–37,186]

* Total annual weighted encounters adjusted for complex survey design. Outpatient visits estimated from the National Ambulatory Medical Care Survey (NAMCS) and averaged based on pooled data from three-year eras. Emergency visits estimated from the Nationwide Emergency Department Sample (NEDS); data not available in NEDS for 2005. Inpatient visits estimated from the National Inpatient Sample.

N/A data not available

Table 2.

Temporal comparisons of demographic distribution of ambulatory, emergency department, and inpatient visits in the United States, 2005-2016.

Characteristic %, RSE	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Ambulatory Visits												
Disease												
Crohn's disease		68.9 (8.9)			64.8 (8.7)			50.4 (10.9)		41.2 (13.3)		
Ulcerative colitis		31.1 (19.7)			35.2 (16.0)			49.6 (11.1)		58.8 (9.3)		
Age category												
<40 years		37.1 (16.6)			36.0 (16.9)			28.8 (12.5)		15.1 (26.5)		
40 to 59 years		40.5 (15.1)			38.5 (13.0)			41.5 (9.8)		45.4 (12.7)		
60 years		22.4 (19.5)			25.5 (18.3)			29.7 (8.9)		39.4 (8.9)		
Female		65.5 (8.2)			50.8 (9.1)			53.6 (6.6)		63.2 (10.7)		
White race		85.7 (5.7)			90.2 (4.7)			90.9 (2.4)		80.0 (7.2)		
Payment method *												
Private		65.6 (9.8)			65.1 (7.6)			70.4 (4.2)		44.9 (16.5)		
Medicaid/Medicare		25.9 (20.5)			33.4 (15.1)			24.4 (11.3)		50.2 (15.6)		
Specialist care *												
Primary care		30.0 (20.7)			28.3 (20.7)			34.2 (20.7)		36.8 (19.8)		
Medical care		64.0 (10.5)			57.6 (13.4)			60.3 (11.4)		51.0 (15.7)		
Geographic region												
Northeast		27.5 (28.2)			24.2 (28.4)			34.4 (21.7)		34.2 (21.3)		
Midwest		*			*			18.9 (24.7)		18.5 (23.9)		
South		43.3 (20.7)			38.0 (21.5)			28.6 (15.9)		*		
West		*			23.1 (25.5)			18.1 (19.7)		19.6 (27.9)		
Emergency Visits												
Disease												
Crohn's disease	N/A	69.6 (0.8)	69.9 (0.8)	69.4 (0.7)	68.8 (0.8)	69.6 (0.8)	68.6 (0.8)	69.1 (0.8)	69.3 (0.7)	67.8 (0.9)	67.7 (0.8)	66.6 (0.9)
Ulcerative colitis		30.4 (1.8)	30.1 (1.9)	30.6 (1.5)	31.2 (1.7)	30.4 (1.8)	31.4 (1.6)	30.9 (1.8)	30.7 (1.6)	32.2 (1.8)	32.3 (1.7)	33.4 (1.8)
Age category												
<40 years		51.4 (1.1)	52.3 (1.2)	52.1 (1.1)	52.7 (1.2)	52.8 (1.1)	52.7 (1.0)	53.1 (1.1)	54 (1.0)	53.6 (1.0)	53.3 (1.0)	52.1 (1.0)

Characteristic %, RSE	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
40 to 59 years		31.9 (1.6)	31.2 (16.5)	30.8 (1.4)	30.7 (1.5)	31.3 (1.4)	30.5 (1.3)	31.1 (1.4)	30.2 (1.3)	31.2 (1.4)	30.5 (1.4)	31.0 (1.3)
60 years		16.7 (2.3)	16.5 (2.6)	17.1 (2.4)	16.6 (2.5)	15.9 (2.7)	16.8 (2.5)	15.8 (2.5)	15.8 (2.5)	15.2 (2.5)	16.2 (2.3)	16.9 (2.1)
Female		56.1 (0.9)	56.0 (1.0)	56.1 (0.9)	55.9 (0.9)	55.7 (0.9)	54.3 (0.9)	54.7 (0.9)	54.1 (0.9)	54.3 (0.9)	55.7 (0.8)	55.0 (0.7)
Payment method												
Private		47.3 (1.8)	46.2 (1.6)	44.1 (1.7)	42.4 (2.0)	41.3 (1.9)	40.5 (2.0)	38.7 (2.1)	38.3 (2.1)	38.2 (2.0)	41.1 (1.8)	40.7 (1.7)
Medicare		21.4 (2.2)	21.0 (2.4)	22.1 (2.2)	21.4 (2.1)	20.9 (2.3)	22.1 (2.1)	21.3 (2.1)	21.8 (2.1)	21.1 (2.1)	21.3 (2.0)	22.4 (1.9)
Medicaid		14.0 (3.8)	15.3 (3.5)	15.9 (3.2)	17.5 (3.4)	17.9 (3.1)	18.4 (2.7)	19.5 (3.0)	19.4 (3.0)	25.3 (2.7)	24.2 (2.9)	24.3 (2.6)
Geographic region												
Northeast		22.9 (5.9)	20.7 (5.8)	20.0 (5.6)	19.7 (5.7)	20.1 (6.3)	20.4 (5.2)	20.7 (5.8)	19.7 (6.1)	19.2 (7.2)	17.8 (5.2)	20.5 (6.9)
Midwest		24.2 (4.8)	25.0 (5.7)	23.7 (5.8)	24.5 (5.6)	24.2 (6.0)	23.3 (5.9)	24.3 (5.9)	22.2 (5.1)	24.1 (6.6)	22.9 (4.9)	23.3 (6.3)
South		35.8 (3.7)	38.1 (4.0)	39.3 (3.8)	38.0 (3.5)	38.8 (3.9)	39.3 (3.5)	38.3 (4.5)	41.6 (3.4)	41.0 (4.3)	41.3 (3.5)	39.4 (4.8)
West		17.1 (6.0)	16.2 (7.0)	16.9 (5.4)	17.9 (5.8)	17.0 (6.1)	16.9 (5.4)	16.7 (5.8)	16.6 (5.8)	15.7 (5.4)	18.0 (5.1)	16.8 (6.2)
Inpatient Visits												
Disease												
Crohn's disease	62.6 (0.9)	61.9 (1.0)	61.5 (1.0)	63.1 (0.8)	62.9 (0.9)	63.6 (0.9)	63.2 (0.9)	63.7 (0.6)	61.7 (0.7)	62.5 (0.7)	62.3 (0.7)	62.8 (0.6)
Ulcerative colitis	37.4 (1.5)	38.1 (1.6)	38.5 (1.6)	36.9 (1.4)	37.1 (1.6)	36.4 (1.6)	36.8 (1.5)	36.3 (1.1)	38.3 (1.1)	37.5 (1.1)	37.7 (1.1)	37.2 (1.1)
Age category												
<40 years	43.6 (1.5)	43.5 (1.3)	44.5 (1.3)	46.3 (1.8)	45.6 (1.5)	46.6 (1.4)	45.6 (1.4)	45.4 (1.0)	45.9 (1.0)	46.4 (1.0)	46.1 (1.0)	45.2 (1.0)
40 to 59 years	33.9 (1.4)	34.5 (1.5)	33.5 (1.5)	32.0 (1.4)	32.9 (1.4)	32.6 (1.4)	32.6 (1.3)	32.8 (1.1)	32.5 (1.1)	32.9 (1.2)	32.1 (1.1)	31.8 (1.1)
60 years	22.5 (2.5)	22.0 (2.2)	22.0 (2.3)	21.7 (3.1)	21.5 (2.9)	20.9 (2.6)	21.8 (2.6)	21.8 (1.6)	21.6 (1.8)	20.7 (1.6)	21.8 (1.7)	23.0 (1.6)
Female	56.2 (0.9)	55.8 (1.0)	55.9 (0.9)	56.1 (1.1)	55.3 (1.0)	55.3 (1.0)	55.6 (0.8)	54.7 (0.7)	54.2 (0.7)	53.9 (0.7)	53.7 (0.8)	53.2 (0.7)
Race												
White	80.6 (1.1)	77.4 (1.6)	75.6 (1.7)	77.2 (1.5)	77.4 (1.4)	74.2 (1.8)	73.9 (1.4)	74.4 (0.9)	74.1 (0.8)	73.8 (0.8)	73.4 (0.8)	73.6 (0.8)
Black	9.8 (6.6)	11.1 (6.6)	11.9 (7.2)	11.1 (5.9)	11.2 (5.9)	13.9 (6.3)	14.3 (5.3)	13.8 (3.3)	13.4 (3.2)	13.8 (2.9)	14.6 (2.9)	14.3 (2.8)
Hispanic	6.0 (9.4)	7.6 (11.1)	7.9 (10.8)	7.1 (12.1)	6.7 (9.6)	7.1 (9.3)	7.4 (10.4)	7 (5.2)	8.1 (4.9)	7.7 (4.7)	7.7 (4.6)	7.6 (4.8)
Asian or Pacific Islander	1.1 (11.7)	1.2 (13.7)	1.4 (13.8)	1.1 (11.8)	1.2 (13.3)	1.3 (13.3)	1.3 (13.1)	1.2 (8.4)	1.4 (7.5)	1.4 (7.9)	1.6 (9.3)	1.3 (7.0)
Other	2.4 (9.9)	2.7 (18.0)	3.1 (11.3)	3.4 (13.6)	3.5 (12.7)	3.5 (24.6)	3.0 (12.7)	3.5 (10.9)	3.1 (8.1)	3.3 (6.6)	2.7 (8.3)	3.2 (7.8)
Payment method												
Private	54.7 (1.7)	53.1 (1.9)	52.2 (1.9)	53.5 (2.0)	51.1 (2.5)	47.6 (2.5)	48.8 (1.8)	47.3 (1.3)	46.8 (1.3)	47.2 (1.2)	46.6 (1.3)	46.7 (1.2)
Medicare	23.9 (2.2)	23.1 (2.3)	23.2 (2.3)	22.5 (3.0)	22.7 (2.8)	23.3 (2.6)	23.9 (2.3)	24.4 (1.6)	24.5 (1.6)	23.9 (1.6)	24.9 (1.6)	25.3 (1.6)

Characteristic %, RSE	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Medicaid	10.3 (4.6)	11.1 (4.8)	11.4 (4.4)	12.1 (4.3)	12.6 (4.2)	14.8 (3.6)	14.5 (3.5)	14.6 (2.4)	14.7 (2.4)	18.7 (2.0)	19.5 (2.0)	19.5 (2.0)
Geographic region												
Northeast	22.3 (6.2)	23.1 (7.0)	22.0 (7.1)	26.0 (12.2)	21.6 (7.9)	22.6 (6.1)	22.9 (8.5)	22.2 (4.1)	21.9 (3.9)	21.6 (4.0)	22.2 (4.0)	22.0 (4.1)
Midwest	23.9 (6.1)	23.0 (6.0)	23.5 (5.4)	22.1 (7.3)	28 (11.0)	24.9 (6.9)	23.1 (5.9)	24.5 (4.1)	24.5 (3.9)	24.3 (4.0)	24.2 (4.3)	24.5 (4.1)
South	36.6 (5.0)	37.0 (4.6)	37.2 (4.5)	36.0 (6.7)	34.5 (6.3)	35.9 (4.3)	38.7 (4.7)	37.5 (2.3)	38.0 (2.3)	37.9 (2.3)	37.6 (2.4)	37.8 (2.4)
West	17.2 (9.6)	16.9 (7.0)	17.3 (5.4)	15.9 (7.7)	15.8 (7.7)	16.6 (6.2)	15.2 (6.4)	15.8 (3.9)	15.6 (3.5)	16.2 (3.7)	16.1 (3.8)	15.7 (3.8)

* Suppressed data points due to unreliable national-level estimates; the National Center for Health Statistics considers estimates unreliable if there are fewer than 30 unweighted sample observations or relative standard error is >30%. Data not presented for all payment and specialist categories due to suppressed data.

N/A data not available, RSE relative standard error