

## Disparities in Access to Endoscopy for Patients With Upper Gastrointestinal Bleeding Presenting to Emergency Departments



This article has an accompanying continuing medical education activity, also eligible for MOC credit, on page e23. Learning Objective: Upon completion of this CME activity, successful learners will be able to assess the effect of race/ethnicity, rurality, and teaching status on access to upper endoscopy for patients presenting to the emergency room with a primary diagnosis of upper gastrointestinal bleeding.

In the United States, upper gastrointestinal bleeding (UGIB) accounts for approximately 311,000 admissions yearly.<sup>1</sup> The standard of care in most patients hospitalized with acute UGIB is evaluation with esophagogastroduodenoscopy (EGD).<sup>2</sup> For Black and Hispanic populations, access to endoscopic evaluation when presenting to the emergency department (ED) with a primary diagnosis of acute UGIB has not been clearly described. A previous study using a nationwide all-payer database found that among hospitalized patients with nonvariceal UGIB, uninsured and Black patients have lower odds of undergoing EGD, Black and Hispanic patients have lower odds of early endoscopic evaluation (<24 hours), and Native American patients have the highest odds of in-hospital mortality.<sup>3</sup> Access, as measured by services rendered during an ED visit, is particularly relevant to Black and Hispanic populations, who are more likely to visit EDs and use EDs for routine clinical care.<sup>4</sup>

We aim to assess national disparities in access to endoscopic care among individuals presenting to the

ED with UGIB. We hypothesize that historically marginalized racial/ethnic populations have lower odds of undergoing EGD.

A retrospective analysis of EGDs in patients presenting to EDs with a primary diagnosis of UGIB based on International Classification of Diseases, 10th Revision (ICD-10) codes was performed using the 2019 Nationwide Emergency Department Sample (details in [Supplementary Table 1](#)). Variables assessed included race/ethnicity, age, sex, hospital region, median income by zip code, insurance, hospital location and teaching status, and Charlson comorbidity index. The primary outcome was receipt of EGD as determined by Current Procedural Terminology codes in the ED or ICD-10-Procedure Coding System (PCS) for inpatients ([Supplementary Table 1](#)) because EGD is the recommended first line of evaluation for UGIB.<sup>2</sup> Survey-adjusted and population-weighted logistic univariate and multivariable logistic regression analyses were performed.

The interactions between race/ethnicity, UGIB severity as indicated by red blood cell transfusion (codes used in [Supplementary Table 1](#)), public (Medicare or Medicaid) vs private insurance, hospital rurality, and hospital teaching status were also assessed with stratified analyses. We also performed sensitivity analysis including nonspecific gastrointestinal bleeding diagnoses that may include UGIB (melena, K921; gastrointestinal hemorrhage unspecified, K922) with outcome of EGD or colonoscopy (defined by Current Procedural Terminology or ICD-10-PCS codes [[Supplementary Table 1](#)]).

Among 276,740 individual patient encounters with a primary diagnosis of UGIB, (47,021 discharged from the ED; 12,012 placed in observation; 207,350 admitted to the hospital; and 10,357 with other disposition), 189,547 underwent EGD. Most individuals undergoing EGD were White (66.2%), were male (54.3%), had Medicare primary insurance (59.8%), received care in an urban nonteaching hospital (71.0%), and had a Charlson comorbidity index of <4 (72.9%). In multivariable analysis, Black (odds ratio [OR], 0.82; 95% confidence interval [CI], 0.78–0.87),

Native American (OR, 0.60; 95% CI, 0.47–0.76), Medicaid (OR, 0.74; 95% CI, 0.70–0.79), and patients receiving care in rural hospitals (OR, 0.51; 95% CI, 0.48–0.55) had lower odds of undergoing EGD. In comparison, increasing age and median income by zip code, Asian race (OR, 1.7; 95% CI, 1.49–1.94), and receiving care in urban teaching hospitals (OR, 1.06; 95% CI, 1.01–1.11) were independent predictors for undergoing EGD ([Supplementary Table 2](#)). The great majority of EGDs were performed in those admitted to the hospital as compared to those discharged from the ED, and the odds of EGD related to racial/ethnic group were similar in those admitted and the overall group ([Supplementary Table 2](#)).

Stratified by urban/rural and teaching/nonteaching hospitals, Black race was associated with lower odds of undergoing EGD in urban teaching hospitals (OR, 0.79; 95% CI, 0.74–0.84) and urban nonteaching hospitals (OR, 0.87; 95% CI, 0.77–0.98), whereas Hispanic ethnicity (OR, 0.49; 95% CI, 0.34–0.72) or Native American race (OR, 0.46; 95% CI, 0.28–0.76) was associated with lower odds of undergoing EGD in rural hospitals ([Table 1](#)). When stratified by UGIB severity based on receipt of red blood cell transfusion, the effect of race/ethnicity on EGD was similar to that in the overall population among those without transfusion, but among those receiving transfusion, the differences were not present among the Black (OR, 0.93; 95% CI, 0.81–1.07), Hispanic (OR, 1.10; 95% CI, 0.94–1.29), or Asian (OR, 1.15; 95% CI, 0.89–1.48) populations but persisted among Native American individuals (OR, 0.29; 95% CI, 0.17–0.48) ([Supplementary Table 2](#)). Sensitivity analysis including nonspecific potential diagnoses of UGIB showed decreased odds of EGD or colonoscopy in Black (OR, 0.78; 95% CI, 0.75–0.81), Native American (OR, 0.76; 95% CI, 0.64–0.90), and Hispanic patients (OR, 0.94; 95% CI, 0.90–0.98) ([Supplementary Table 2](#)).

In summary, we found that Black and Native American patients had lower odds of undergoing EGD for UGIB compared to White patients. When

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**Table 1.** Primary Adjusted Multivariable Analysis With Overall Receipt of Upper Endoscopy for Patients With UGIB and Secondary Stratified Analysis by Urban/Rural and Teaching Hospital Status

Race	n	Overall, OR (95% CI)	Urban nonteaching hospital, OR (95% CI)	Urban teaching hospital, OR (95% CI)	Rural hospital, OR (95% CI)
White	179,949	Reference	Reference	Reference	Reference
Black	45,452	0.84*** (0.79–0.89)	0.87* (0.77–0.98)	0.79*** (0.74–0.84)	1.02 (0.83–1.25)
Hispanic	33,252	0.98 (0.92–1.04)	1.11 (0.97–1.27)	0.97 (0.90–1.04)	0.49*** (0.34–0.72)
Asian	8866	1.7*** (1.49–1.94)	1.40* (1.07–1.84)	1.71*** (1.47–1.99)	2.92** (1.40–6.11)
Native American	1491	0.6*** (0.47–0.76)	0.53* (0.29–0.935)	0.85 (0.60–1.20)	0.46** (0.28–0.76)
Other	7734	1.01 (0.90–1.14)	1.00 (0.78–1.27)	1.04 (0.91–1.20)	0.77 (0.37–1.61)

NOTE. \* $P < .05$ . \*\* $P < .01$ . \*\*\* $P < .001$ .

stratified by context, Black patients had lower odds of undergoing EGD for UGIB compared to White patients in urban teaching and nonteaching hospitals. These findings are supported by prior research showing that Black patients have lower odds of undergoing EGD and early endoscopic evaluation (<24 hours).<sup>3</sup> Although socioeconomic factors and comorbidity burden disparately affect historically marginalized populations, the disparity in access persists after our adjustment for comorbidities, primary insurance payer, and zip code income quartile. Explanations for this disparity could include individual barriers (time off, lost wages, and inability to secure affordable childcare) and structural barriers (health care fluency, mistrust of the health care system, implicit bias, and structural racism). Health care fluency, in particular trust and ability to self-advocate in the health care system, could potentially affect the perceived understanding regarding the urgency of an acute UGIB and the recommendation to undergo potential EGD.<sup>5</sup>

We found that receiving care in a rural hospital was independently associated with lower odds of undergoing EGD for UGIB, and Hispanic and Native American patients had lower odds of undergoing EGD for UGIB compared to White patients in rural hospitals. Access to gastroenterologists is lower in rural communities than urban regions, which could explain findings of decreased access.<sup>6</sup> Rural EDs have greater utilization rates compared to urban EDs with increased care of Medicaid and

uninsured patient populations, which could increase structural barriers specific to race/ethnicity.<sup>7</sup>

Implicit bias can lead to varying treatment recommendations across race/ethnicity, which may be exacerbated under high-stress periods, such as an episode of acute UGIB, and contribute toward Black, Hispanic, and Native American populations having worse quality health care measures.<sup>8,9</sup> Although our findings do not explicitly link these individual and structural barriers to disparities in access, structural, interpersonal, and internalized racism is a modifiable risk factor that may be addressed, in part, through antiracism policies to combat ongoing inequities in care.<sup>10</sup> Further studies should assess barriers on the health care continuum for UGIB, such as appropriate access to endoscopic care and equitable health care delivery, including policies governing access to procedural resources.

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## Supplementary Material

Note: To access the supplementary material accompanying this article, visit the online version of *Gastroenterology* at [www.gastrojournal.org](http://www.gastrojournal.org), and at <https://doi.org/10.1053/j.gastro.2022.10.001>.

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#### **CRedit Authorship Contributions**

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The authors disclose no conflicts.

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## Supplementary Methods

The Healthcare Cost and Utilization Project (HCUP)'s Nationwide Emergency Department Sample (NEDS) from the Agency for Healthcare Research and Quality is the largest US all-payer ED database publicly available and includes approximately 33 million ED visits across 41 states. The HCUP implements a weighting methodology that permits an estimated national sample of approximately 143 million ED visits. NEDS combines information from the State Inpatient Database and State Emergency Department Database. The State Inpatient Database contains information about patients seen initially in the ED and then admitted to the same

hospital, and the State Emergency Department Database contains information about patients seen in the ED who are not subsequently admitted. Given these combined databases, the primary diagnostic code (ED or inpatient) for UGIB was used for this study. All diagnoses reported using the ICD-10 Clinical Modification (ICD-10-CM/PCS) coding system ([Supplementary Table 1](#)).

The 2019 release of NEDS was the first to contain patient-reported race/ethnicity data. Variables assessed included race/ethnicity, age, sex, hospital region, median income by zip code, insurance, hospital location and teaching status, and Charlson comorbidity index based on previously

published and validated ICD codes. Receipt of EGD among patients with a primary diagnosis of UGIB was measured by Current Procedural Terminology codes in the ED or ICD-10-PCS for inpatients, including diagnostic EGD and hemostasis in the esophagus, stomach, or duodenum as well as band ligation ([Supplementary Table 1](#)). All study investigators completed the required data use agreement training and documentation; complied with HCUP privacy protections policy; and confirmed that no individual persons or hospitals have been identified, that all aggregate statistical reporting contains at least 2 hospitals in any individual cell, and that each cell contains more than 10 encounters.

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**Supplementary Table 1.** ICD-10-CM Codes Used to Identify Patient ED Encounters With a Primary Diagnosis of UGIB

UGIB	ICD-10-CM codes
Bleeding ulcer	K22.11, K25.0, K25.2, K25.4, K25.6, K26.0, K26.2, K26.4, K26.6, K27.0, K27.2, K27.4, K27.6, K28.0, K28.2, K28.4, K28.6
Variceal bleed	I85.01, I85.11
Mallory-Weiss tears	K22.6
Angiodysplasia	K31.811
Dieulafoy's lesion	K31.82
Gastritis/duodenitis with bleeding	K29.01, K29.21, K29.31, K29.41, K29.51, K29.61, K29.71, K29.81, K29.91
Other	K22.8, K92.0
	ICD-10-PCS and CPT Codes
Red blood cell transfusion	30233N0, 30233N1, 30233H0, 30233H1, 30233P0, 30233P1, 30243N0, 30243N1, 30243H0, 30243H1, 30243P0, 30243P1, 30230N0, 30230N1, 30230H0, 30230H1, 30230P0, 30230P1, 30240N0, 30240N1, 30240H0, 30240H1, 30240P0, 30240P1 36430, 36440, 36450, 36444, 36455, 36456, 36460
Upper endoscopy	Diagnostic 0DJ04ZZ, 0DJ08ZZ, 0DJ64ZZ, 0DJ68ZZ, 0DB14ZX, 0DB24ZX, 0DB34ZX, 0DB44ZX, 0DB54ZX, 0DB64ZX, 0DB74ZX, 0DB84ZX, 0DB94ZX, 0DB18ZX, 0DB28ZX, 0DB38ZX, 0DB48ZX, 0DB58ZX, 0DB68ZX, 0DB78ZX, 0DB88ZX, 0DB98ZX Esophagus hemostasis 0D514ZZ, 0D524ZZ, 0D534ZZ, 0D544ZZ, 0D554ZZ, 0D518ZZ, 0D528ZZ, 0D538ZZ, 0D548ZZ, 0D558ZZ, 0DQ14ZZ, 0DQ24ZZ, 0DQ34ZZ, 0DQ44ZZ, 0DQ54ZZ, 0DQ18ZZ, 0DQ28ZZ, 0DQ38ZZ, 0DQ48ZZ, 0DQ58ZZ Stomach hemostasis 0D564ZZ, 0D574ZZ, 0D568ZZ, 0D578ZZ, 0DQ64ZZ, 0DQ74ZZ, 0DQ68ZZ, 0DQ78ZZ Duodenum hemostasis 0D594ZZ, 0D598ZZ, 0DQ84ZZ, 0DQ94ZZ, 0DQ88ZZ, 0DQ98ZZ Unspecified upper gastrointestinal hemostasis 3E0G8TZ Band ligation 06L34CZ, 06L38CZ Diagnostic 43235, 43239 Any hemostasis 43255 Submucosal injection 43236, 43243 Band ligation 43244
Lower endoscopy	Diagnostic 0DJD4ZZ, 0DJD8ZZ, 0DBA4ZX, 0DBB4ZX, 0DBC4ZX, 0DBE4ZX, 0DBF4ZX, 0DBG4ZX, 0DBH4ZX, 0DBK4ZX, 0DBL4ZX, 0DBM4ZX, 0DBN4ZX, 0DBP4ZX, 0DBA8ZX, 0DBB8ZX, 0DBC8ZX, 0DBE8ZX, 0DBF8ZX, 0DBG8ZX, 0DBH8ZX, 0DBK8ZX, 0DBL8ZX, 0DBM8ZX, 0DBN8ZX, 0DBP8ZX Diagnostic 45378, 45300, 45330
Proportion of discharged patients with UGIB receiving an EGD, % (n/total)	8.5 (4164/48,706)
Proportion of admitted patients (inpatient or observation) with UGIB receiving an EGD, % (n/total)	84.2 (184,550/219,181)

NOTE. Also includes the percentages of patients who underwent EGD if discharged from the ED or if admitted for inpatient or observation stay.

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**Supplementary Table 2.** Univariate and Multivariate Logistic Regression of EGD in UGIB, Stratified Analysis by Bleed Severity Defined by Receipt of Red Blood Cell Transfusion, Public (Medicare or Medicaid) or Private Primary Insurance Payer, and Inclusion of Unspecified ICD-10 Codes for Gastrointestinal Bleeding With Endoscopic Evaluation Defined as EGD or Diagnostic Colonoscopy

Characteristics	Univariate		Multivariate	
	OR	95% CI	OR	95% CI
<b>Age, y</b>				
<25	Reference	Reference	Reference	Reference
25–50	4.75***	4.27–5.28	3.75***	3.37–4.17
50–75	18.86***	16.99–20.93	9.8***	8.79–10.92
>75	25.56***	22.96–28.46	10.9***	9.68–12.27
<b>Sex</b>				
Male	Reference	Reference	Reference	Reference
Female	1.08***	1.04–1.11	0.94**	0.91–0.98
<b>U.S. Region</b>				
Northeast	Reference	Reference	Reference	Reference
Midwest	0.87***	0.82–0.91	1.03	0.97–1.10
South	0.99	0.95–1.05	1.2***	1.13–1.27
West	0.81***	0.77–0.86	0.86***	0.81–0.92
<b>Zip code income quartile</b>				
\$1–\$47,999	Reference	Reference	Reference	Reference
\$48,000–\$60,999	1.13***	1.08–1.18	1.06*	1.00–1.12
\$61,000–\$81,999	1.26***	1.20–1.32	1.13***	1.07–1.20
\$82,000+	1.48***	1.40–1.55	1.22***	1.14–1.29
<b>Primary payer</b>				
Medicare	Reference	Reference	Reference	Reference
Medicaid	0.29***	0.27–0.30	0.72***	0.68–0.77
Private insurance	0.41***	0.39–0.43	0.99	0.93–1.05
Self-pay	0.22***	0.21–0.24	0.69***	0.63–0.74
No charge	0.61***	0.47–0.78	1.42*	1.07–1.89
Other <sup>a</sup>	0.4***	0.36–0.45	0.82**	0.73–0.93
<b>Charlson comorbidity index</b>				
0	Reference	Reference	Reference	Reference
1	3.09***	2.95–3.25	2.14***	2.03–2.25
2	4.55***	4.28–4.84	2.54***	2.38–2.71
3	5.99***	5.58–6.42	3.56***	3.30–3.83
≥4	6.40***	6.02–6.72	3.32***	3.12–3.52
<b>Urban vs rural and teaching status<sup>b</sup></b>				
Urban (>50,000) and nonteaching hospital	Reference	Reference	Reference	Reference
Urban (>50,000) and teaching hospital	1.05*	1.01–1.10	1.06*	1.01–1.11
Rural (<50,000) hospital	0.49***	0.46–0.52	0.51***	0.48–0.55
<b>Race</b>				
White	Reference	Reference	Reference	Reference
Black	0.81***	0.78–0.85	0.84***	0.79–0.89
Hispanic	0.79***	0.75–0.84	0.98	0.92–1.04
Asian	1.66***	1.48–1.87	1.7***	1.49–1.94
Native American	0.4***	0.33–0.50	0.6***	0.47–0.76
Other	0.86**	0.78–0.95	1.01	0.90–1.14
<b>Stratified Analysis by Bleed Severity Defined by Receipt of RBC Transfusion<sup>c</sup></b>				
	No RBC transfusion		Received RBC transfusion	
	OR	95% CI	OR	95% CI
<b>Urban vs rural and teaching status<sup>b</sup></b>				
Urban (>50,000) and nonteaching hospital	Reference	Reference	Reference	Reference
Urban (>50,000) and teaching hospital	1.11***	1.05–1.17	0.94	0.84–1.06
Rural (<50,000) hospital	0.49***	0.45–0.53	0.50***	0.42–0.60



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Supplementary Table 2. Continued

Stratified Analysis by Bleed Severity Defined by Receipt of RBC Transfusion <sup>c</sup>				
	No RBC transfusion		Received RBC transfusion	
	OR	95% CI	OR	95% CI
Race				
White	Reference	Reference	Reference	Reference
Black	0.78***	0.73–0.83	0.93	0.81–1.07
Hispanic	0.90**	0.84–0.97	1.10	0.94–1.29
Asian	1.58***	1.36–1.84	1.15	0.89–1.48
Native American	0.71*	0.55–0.93	0.29***	0.17–0.48
Other	0.93	0.81–1.06	1.03	0.78–1.36

Stratified Analysis by Stratification by Public (Medicare or Medicaid) or Private Primary Insurance Payer <sup>c</sup>				
	Public insurance		Private insurance	
	OR	95% CI	OR	95% CI
Urban vs rural and teaching status <sup>b</sup>				
Urban (>50,000) and nonteaching hospital	Reference	Reference	Reference	Reference
Urban (>50,000) and teaching hospital	1.02	0.96–1.08	1.16**	1.05–1.28
Rural (<50,000) hospital	0.50***	0.46–0.54	0.54***	0.46–0.64
Race				
White	Reference	Reference	Reference	Reference
Black	0.79***	0.74–0.85	0.85*	0.75–0.96
Hispanic	0.97	0.90–1.05	0.93	0.81–1.06
Asian	1.59***	1.35–1.88	1.66***	1.31–2.11
Native American	0.51***	0.39–0.67	0.55	0.29–1.05
Other	1.04	0.89–1.22	1.03	0.80–1.32

Inclusion of Unspecified ICD-10 Codes for Gastrointestinal Bleeding With Endoscopic Evaluation Defined as EGD or Diagnostic Colonoscopy			
	OR	95% CI	
Urban vs rural and teaching status <sup>b</sup>			
Urban (>50,000) and nonteaching hospital	Reference	Reference	
Urban (>50,000) and teaching hospital	1.20***	1.16–1.23	
Rural (<50,000) hospital	0.41***	0.39–0.43	
Race			
White	Reference	Reference	
Black	0.78***	0.75–0.81	
Hispanic	0.94**	0.90–0.98	
Asian	1.34***	1.24–1.45	
Native American	0.76**	0.64–0.90	
Other	1.00	0.92–1.08	

NOTE. Upper endoscopic evaluation. Weighted population = 276,740. Number of encounters = 64,330. \* $P < .05$ . \*\* $P < .01$ . \*\*\* $P < .001$ .

RBC = red blood cell.

<sup>a</sup>Includes Workers Compensation, Civilian Health and Medical Program of the Uniformed Services (CHAMPUS), Civilian Health and Medical Program of the Department of Veteran's Affairs (VA) (CHAMPVA), Title V, and other government programs.

<sup>b</sup>NEDS does not differentiate teaching status for rural hospitals because only a small number of rural hospitals were teaching.

<sup>c</sup>Multivariable weighted logistic regression adjusted for age (per 5-year increase), sex, hospital region, income quartile, Charlson comorbidity index score, and year.