Gastro Hep Advances 2024;3:482–490

ORIGINAL RESEARCH—CLINICAL

Demographic Comparison of the Burden of Endoscopically Screenable Cancers in the United States

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BACKGROUND AND AIMS: Gastrointestinal cancer incidence varies by race and ethnicity. In the United States (US), there are screening guidelines for esophageal cancer (EC) and colorectal cancer (CRC), but not gastric cancer (GC). We compared GC, CRC, and EC incidence among the most populous racial and ethnic groups to inform US interception strategies. **METHODS:** We used SEER*Stat to compare GC, CRC, and EC incidence rates across non-Hispanic White (NHW), non-Hispanic Black, Hispanic, and the 8 largest Asian American populations using the Surveillance, Epidemiology, and End Results 9 registries (2010–2014). **RESULTS:** Noncardia GC incidence was highest among Korean (18.7 cases per 100,000) and lowest among NHW (1.4 cases per 100,000) Americans. CRC incidence was highest among non-Hispanic Black, Southeast Asian, and Japanese (35.9, 34.2, and 33.8 per 100,000, respectively) Americans and lowest among South Asian Americans (18.9 per 100,000). EC incidence was greatest in NHW (4.7 per 100,000) and lowest in Filipino (1.2 per 100,000) Americans. The incidence of noncardia GC slightly exceeded colon cancer in Korean American men (25.5 vs 22.4 per 100,000). GC surpassed EC incidence in all non-White racial and ethnic groups. **CONCLUSION:** The burden of GC, CRC, and EC differs based on race and ethnicity. Non-White racial and ethnic groups experience a disproportionate burden of GC for which systematic programs for cancer interception, similar to CRC and EC, are needed.

Keywords: Colorectal Neoplasms; Disparities; Early Detection of Cancer; Esophageal Neoplasms; Stomach Neoplasms

Introduction

In the United States, there were 17,661 new cases of esophageal cancer (EC), 22,425 new cases of gastric cancer (GC), and 126,240 new cases of colorectal cancer (CRC) that were diagnosed in 2020.[1] Based on current projections, it is estimated that in 2023 these figures will increase to 21,560 new EC cases, 26,500 new GC cases, and 153,020 new CRC cases.[2] Cancer stage at the time of diagnosis is the main driver of prognosis for luminal gastrointestinal (GI) cancer, with an advanced stage diagnosis almost invariably associated with high mortality. Endoscopy and colonoscopy allow the opportunity for direct visualization and histopathological confirmation of preneoplasia and neoplasia. At present, there are guidelines informing screening practices for CRC and EC in average-risk and high-risk individuals, as well as guidelines informing subsequent surveillance intervals if precancerous conditions are identified.[3–5] The United States Preventive Services Task Force and multiple, national GI societies currently recommend CRC screening for all adults aged 45–75 years old and selective screening for adults 76–85 years old if it is medically appropriate and aligns with shared decision-making between the patient and clinician.[6–8] Implementation of CRC screening guidelines for average-risk and high-risk populations has led to a significant decline in CRC incidence and mortality since 2000 and the rate of decline correlates directly with the rate of adherence to screening recommendations.[7,9]

Screening individuals deemed as high-risk for esophageal adenocarcinoma (EAC) or Barrett's esophagus, a premalignant precursor for EAC, (i.e., White race, age $\geq$ 50 years, central adiposity, history of smoking, and family history of EAC or Barrett's esophagus) is also recommended by several GI societies, along with subsequent surveillance among those diagnosed with Barrett's esophagus.[3,10]

Abbreviations used in this paper: **CI, confidence interval; CRC, colorectal cancer; EAC, esophageal adenocarcinoma; EC, esophageal cancer; ESCC, esophageal squamous cell carcinoma; GC, gastric cancer; GI, gastrointestinal; ICD-O-3, International Classification of Diseases for Oncology, 3rd edition; NHB, non-Hispanic Black; NHW, non-Hispanic White; NOS, not otherwise specified; SEER, Surveillance, Epidemiology, and End Results; US, United States.**

Most current article

2772-5723
https://doi.org/10.1016/j.gastha.2024.01.005

Modeling studies have found screening and surveillance of Barrett's esophagus to be cost-effective in high-risk groups (ie, 50-year-old males with acid reflux).[3,11] Screening for Barrett's esophagus and EAC in the general population, however, is not recommended.[12]

Guidance for GC prevention and early detection in US populations, by contrast, is noticeably lacking and, at the time of this writing, there are no established evidence-based recommendations for GC screening among high-risk populations. This is despite 1) GC having known premalignant stages, similar to both EAC and CRC, 2) an established understanding of high-risk populations who might benefit most from screening (analogous to EC screening recommendations), and 3) substantial evidence demonstrating that endoscopic or surgical resection of early-stage GC is most often curative.[2,13–16] In the United States, there is a striking disproportionate burden of noncardia GC among US immigrants and other non-White racial and ethnic groups.[16–18] To this effect, modeling studies have demonstrated the cost-effectiveness of endoscopic screening for noncardia GC at the time of colonoscopy for CRC screening in non-White racial and ethnic minority populations.[18–20] Yet, GC screening still does not occur despite these cancer burden statistics and supportive modeling studies. We hypothesize that providing comparative incidence data according to disaggregated racial and ethnic groups might further support and emphasize the potential value of targeted opportunistic screening for GC.

By 2065, it is anticipated that immigrants and their descendants will account for nearly 90% of US population growth, with Asian Americans expected to become the largest immigrant group (38%), followed by Hispanic (31%), non-Hispanic White (NHW) (20%), and non-Hispanic Black (NHB) (9%) Americans.[21] Given the projected demographic changes over the next few decades, public health efforts need to accurately capture shifting epidemiologic trends to target cancer risk reduction efforts on the highest-risk groups, and to guide research directed at underlying etiologies for these disparities. Herein, we aim to provide a comprehensive analysis and comparison of cancer incidence for GC, CRC, and EC across major racial and ethnic groups in the US, including the 8 most populous Asian American ethnic groups. To achieve this objective, we used national cancer statistics from the Surveillance, Epidemiology, and End Results (SEER)-9 registries, which, in contrast to later versions of the SEER registries, contain the most recent cancer registry data for Asian American ethnic groups disaggregated by origin country. In this study, we particularly emphasized GC since it lags behind EC and CRC with respect to risk-based screening guidelines.

Materials and Methods

Data Source and Analytic Cohort

We identified individuals aged 20 years or older with histologically confirmed malignant cases of primary esophageal, colorectal, and GCs diagnosed from January 1, 2010, through December 31, 2014, and registered in the National Cancer Institute's SEER 9 registries [dataset].[22,23] We intentionally selected SEER 9 for this analysis since it is the most recent SEER dataset that contains all data needed to calculate incidence rates for the 10 most populous disaggregated racial and ethnic groups. Specifically, SEER 9 contains the most recent complete data for cancer cases (numerator) as well as race and ethnic-specific population counts (denominator). While this includes Asian American ethnic groups according to country of origin, disaggregated data for other groups, including Hispanic and NHB Americans by country of origin, are not available. For the purpose of cancer incidence rates, Asian American ethnic groups are only fully enumerated in the decennial censuses and any population counts in the years beyond the decennial census need to be estimated. Population estimates for Asian American ethnic groups are not provided, and thus rates for these groups cannot be calculated, beyond the year 2014, as SEER and the National Center for Health Statistics warn against inaccuracies in population extrapolation for long spans of time beyond census years. As such, our analysis was restricted to span through 2014 to ensure our incidence rate estimates were most accurate.

Diagnoses were based on the International Classification of Diseases for Oncology, 3rd edition; details are provided in the Supplemental Material. For GC and CRC, only adenocarcinoma histologies were included, while for EC, esophageal squamous cell carcinoma (ESCC) and adenocarcinoma (EAC) histologies were included. All other histologies were excluded. The first primary, or the first of two or more primary cancers, were included and cases of recurrent cancers were excluded. GC cases were further stratified by anatomic site and categorized as cardia (C16.0), noncardia (C16.1–16.6), and overlapping or not otherwise specified (C16.8–16.9). CRC cases were further categorized as colon (C18.0, C18.2–18.9, excluding appendiceal location) and rectum (C19.9, C20.9).

Age at diagnosis, sex, and racial and ethnic group were recorded for each case. Racial and ethnic groups included NHW, NHB, Hispanic, or non-Hispanic Asian American (herein referred to as "Asian Americans"). Asian Americans were further categorized according to country of origin as: Chinese, Japanese, Filipino, Korean, Vietnamese, South Asian (Asian Indian/Pakistani), Pacific Islander (Hawaiian, Samoan, Guamanian, and Chamorro), and Southeast Asian (Laotian and Kampuchean). Race and ethnic data in SEER 9 were collected from patient medical records and based off self or care-giver report.[24] Population estimates were created using linear interpolation and extrapolation of decennial US Census data.

Statistical Analysis

The outcome for the primary analysis was incident GI cancers based on histology and location. The primary analysis was performed in adults aged 20 years or older. We also conducted a subgroup analysis restricted to cases diagnosed in patients aged 50 years and older. This age was selected since this is the age at which CRC and EC screening exams are most often performed. We acknowledge that the recommended age for initiating average-risk CRC screening is now 45 years old, but this recommendation post-dates the dataset analyzed herein.[6,8] We used SEER*Stat software version 8.3.8 to calculate 5-year (2010–2014) age-adjusted average cumulative incidence

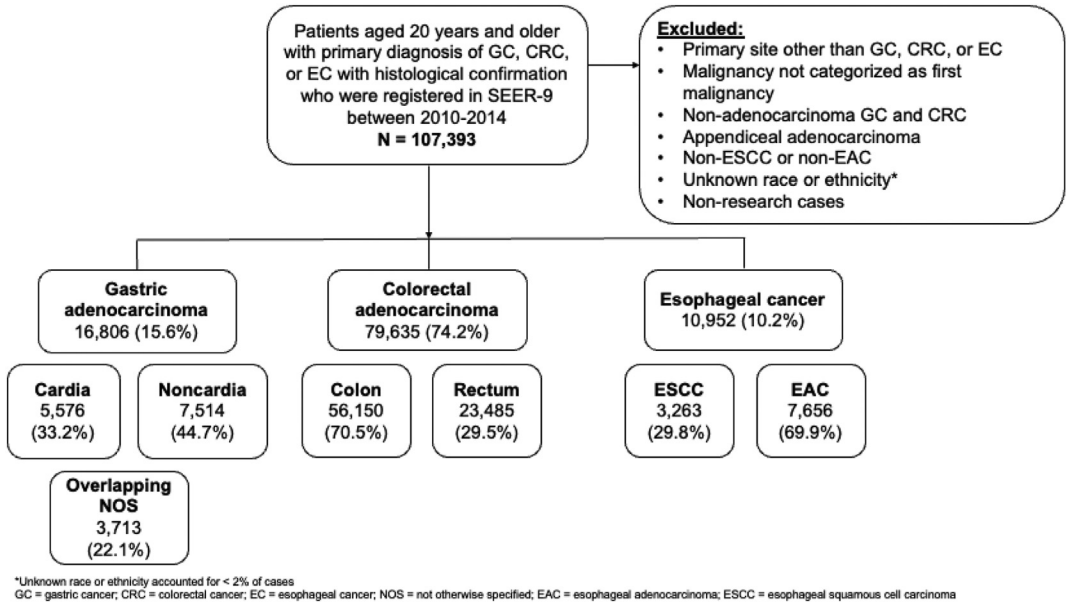

Figure 1. Flow diagram of analytic cohort construction, SEER 2010–2014. *Unknown race or ethnicity accounted for <2% cases. CRC, colorectal cancer; EAC, esophageal adenocarcinoma; EC, esophageal cancer; ESCC, esophageal squamous cell carcinoma; GC, gastric cancer; NOS, not otherwise specified; SEER, Surveillance, Epidemiology, and End Results.

rates with 95% confidence intervals (95% CIs) using previously established methods.[25] Rates were calculated for each anatomic site for all race and ethnic groups and by sex. All rates were expressed per 100,000 person-years and age-adjusted to the US 2000 standard population.

We performed an exploratory *post hoc* analysis to model trends in age-adjusted incidence rates of GC, CRC, and EC by race and ethnicity between 2007 and 2014; details are included in the Supplemental Material.

Results

A total of 107,393 individuals aged 20 years or older diagnosed with GC, CRC, or EC between 2010 and 2014 were included (Figure 1). There were 16,806 GC (5,576 cardia, 7,514 noncardia, and 3,713 overlapping or not otherwise specified), 79,635 CRC, and 10,952 EC. Nearly one-third of all noncardia GC were diagnosed in Hispanic Americans. Chinese, Korean, and Vietnamese Americans together accounted for 15.4% of all noncardia GC diagnosed, but only 4.5% of all CRC diagnosed. The majority of EC (77.3%) and cardia GC (76.2%) were diagnosed in NHW Americans.

GC, CRC, and EC Incidence by Race and Ethnicity and Sex

Among individuals 20 years or older, age-adjusted noncardia GC incidence rates were highest among Korean Americans (25.5 cases [95% CI, 22.5–28.8] and 13.6 cases [95% CI, 11.7–15.7] per 100,000 in men and women, respectively), especially Korean American men, and lowest among NHW Americans (1.8 cases [95% CI, 1.7–1.9] and 1.2 cases [95% CI, 1.1–1.2] per 100,000 in men and women, respectively) (Table 1, Figure A1). Age-adjusted incidence rates of cardia GC were markedly lower than noncardia GC incidence rates for all racial and ethnic groups, except NHW Americans (Table 1).

Age-adjusted CRC incidence exceeded GC and EC incidence for all racial and ethnic groups aged 20 years or older, although the rates varied by group (eg, among NHW Americans, CRC incidence: 29.8 cases [95% CI, 29.5–30.0] per 100,000, GC incidence: 4.6 cases [95% CI, 4.5–4.8] per 100,000, EC incidence: 4.7 cases [95% CI, 4.6–4.8] per 100,000; among Korean Americans, CRC incidence: 31.4 cases [95% CI, 29.3–33.7] per 100,000, GC incidence: 25.9 cases [95% CI, 23.9–28.1] per 100,000, EC incidence: 2.0 cases [95% CI, 1.5–2.7] per 100,000). CRC incidence was highest among NHB (40.7 cases [95% CI, 39.4–42.1] and 32.1 cases [95% CI, 31.0–33.1] per 100,000 in men and women, respectively), Japanese (44.4 cases [95% CI, 40.9–48.2] and 26.6 cases [95% CI, 24.4–29.0] per 100,000 in men and women, respectively) and Southeast Asian Americans (38.4 cases [95% CI, 30.9–47.1] and 30.3 cases [95% CI, 24.0–37.7] per 100,000 in men and women, respectively). South Asian Americans (21.8 cases [95% CI, 19.2–24.7] and 15.7 cases [95% CI, 13.5–18.2] per 100,000 in men and women, respectively) experienced the lowest CRC incidence rates (Table 1, Figure A1). There were notable sex-based differences in CRC incidence. Among men, CRC incidence rates were highest in Japanese Americans (44.4 cases [95% CI, 40.9–48.2] per 100,000) and Pacific Islanders (41.9 cases [95% CI, 36.8–47.5] per 100,000) (Figure A1).

The highest EC incidence rates were in NHW (8.1 cases [95% CI, 7.9–8.3] and 1.7 cases [95% CI, 1.6–1.7] per

Table 1. Age-Adjusted Incidence Rates per 100,000 Person-Years in Individuals Aged 20 y or Older by Anatomic Site according to Race and Ethnicity, SEER 2010–2014

Race and ethnicity	Case count	Incidence rate (95% CI)	Case count	Incidence rate (95% CI)	Case count	Incidence rate (95% CI)	Case count	Incidence rate (95% CI)	Population[d]
	GC, overall		Noncardia		Cardia		Overlapping, NOS		
Non-Hispanic White	8260	4.6 (4.5–4.8)	2519	1.4 (1.4–1.5)	4248	2.4 (2.3–2.5)	1493	0.8 (0.8–0.9)	143,693,323
Non-Hispanic Black	1644	8.0 (7.6–8.4)	943	4.7 (4.4–5.0)	265	1.3 (1.1–1.4)	436	2.1 (1.9–2.3)	23,839,548
Hispanic (all races)	4102	9.9 (9.6–10.2)	2275	5.6 (5.4–5.9)	676	1.6 (1.5–1.8)	1151	2.7 (2.5–2.8)	61,472,861
Chinese	716	10.2 (9.4–11.0)	468	6.6 (6.0–7.3)	91	1.3 (1.0–1.6)	157	2.2 (1.9–2.6)	7,080,293
Japanese	447	10.9 (9.8–12.0)	285	6.8 (6.0–7.7)	57	1.5 (1.1–1.9)	105	2.6 (2.1–3.2)	2,860,163
Filipino	335	5.1 (4.5–5.7)	156	2.4 (2.1–2.9)	94	1.3 (1.0–1.6)	85	1.3 (1.1–1.7)	6,918,864
Korean	653	25.9 (23.9–28.1)	471	18.7 (17.0–20.5)	47	2.0 (1.4–2.7)	135	5.2 (4.4–6.2)	2,902,866
South Asian[a]	154	5.5 (4.5–6.5)	70	2.5 (1.9–3.2)	46	1.5 (1.1–2.1)	38	1.5 (1.0–2.1)	4,601,369
Vietnamese	306	12.7 (11.3–14.3)	220	9.3 (8.0–10.7)	22	0.9 (0.6–1.4)	64	2.5 (1.9–3.2)	2,997,695
Southeast Asian[b]	62	12.2 (9.1–15.8)	47	9.7 (7.0–13.1)	[e]	[e]	12	2.0 (1.0–3.6)	788,581
Pacific Islander[c]	127	9.0 (7.5–10.8)	60	4.3 (3.3–5.5)	30	2.0 (1.3–2.9)	37	2.7 (1.9–3.8)	1,743,970
	CRC, overall		Colon		Rectum				
Non-Hispanic White	51,964	29.8 (29.5–30.0)	36,749	20.9 (20.7–21.1)	15,215	8.9 (8.7–9.0)			143,693,323
Non-Hispanic Black	7668	35.9 (35.1–36.8)	5932	28.0 (27.3–28.8)	1736	7.9 (7.5–8.3)			23,839,548
Hispanic (all races)	12,131	29.0 (28.5–29.6)	8225	20.2 (19.8–20.7)	3906	8.8 (8.5–9.1)			61,472,861
Chinese	1928	26.9 (25.7–28.1)	1383	19.5 (18.4–20.5)	545	7.4 (6.8–8.1)			7,080,293
Japanese	1255	33.8 (31.8–35.8)	893	23.6 (22.0–25.3)	362	10.1 (9.1–11.3)			2,860,163
Filipino	1822	27.1 (25.8–28.4)	1152	17.3 (16.3–18.4)	670	9.7 (9.0–10.5)			6,918,864
Korean	832	31.4 (29.3–33.7)	521	20.1 (18.3–21.9)	311	11.4 (10.1–12.7)			2,902,866
South Asian[a]	549	18.9 (17.1–20.7)	339	12.0 (10.6–13.5)	210	6.9 (5.9–8.1)			4,601,369
Vietnamese	837	31.1 (29.0–33.4)	550	20.7 (19.0–22.6)	287	10.4 (9.2–11.7)			2,997,695
Southeast Asian[b]	195	34.2 (29.3–39.7)	120	21.4 (17.5–25.9)	75	12.8 (9.9–16.2)			788,581
Pacific Islander[c]	454	31.3 (28.4–34.4)	286	19.9 (17.6–22.4)	168	11.4 (9.7–13.3)			1,743,970
	EC, overall		ESCC		EAC				
Non-Hispanic White	8461	4.7 (4.6–4.8)	1862	1.0 (1.0–1.1)	6599	3.6 (3.6–3.7)			143,693,323
Non-Hispanic Black	815	3.7 (3.4–3.9)	614	2.8 (2.5–3.0)	201	0.9 (0.8–1.0)			23,839,548
Hispanic (all races)	1126	2.8 (2.6–3.0)	399	1.0 (0.9–1.2)	727	1.7 (1.6–1.9)			61,472,861
Chinese	121	1.7 (1.4–2.1)	92	1.3 (1.1–1.6)	29	0.4 (0.3–0.6)			7,080,293
Japanese	104	3.0 (2.5–3.7)	69	2.0 (1.6–2.6)	35	1.0 (0.7–1.5)			2,860,163
Filipino	86	1.2 (1.0–1.5)	40	0.6 (0.4–0.8)	46	0.7 (0.5–0.9)			6,918,864
Korean	53	2.0 (1.5–2.7)	47	1.9 (1.3–2.5)	[e]	[e]			2,902,866
South Asian[a]	82	3.3 (2.5–4.1)	63	2.6 (1.9–3.4)	19	0.7 (0.4–1.1)			4,601,369
Vietnamese	51	1.9 (1.4–2.5)	42	1.5 (1.1–2.1)	[e]	[e]			2,997,695
Southeast Asian[b]	12	2.3 (1.1–4.1)	11	2.2 (1.0–4.0)	[e]	[e]			788,581
Pacific Islander[c]	41	2.9 (2.1–3.9)	24	1.7 (1.1–2.5)	17	1.2 (0.7–1.9)			1,743,970

NOS, not otherwise specified.
[a]South Asian: Asian Indian, Pakistani.
[b]Southeast Asian: Laotian, Kampuchean.
[c]Pacific Islander: Hawaiian, Guamanian, Chamorro, Samoan.
[d]Population estimates were created using linear interpolation and extrapolation of decennial US Census data.
[e]Indicates case count less than 15.

100,000 in men and women, respectively), while the lowest were in Filipino (2.5 cases [95% CI, 2.0–3.2] and 0.3 cases [95% CI, 0.2–0.6] per 100,000 in men and women, respectively) Americans (Table 1, Figure A1). There were different patterns based on EC histology. Although NHW individuals had the highest incidence of EAC (6.8 cases [95% CI, 6.6–7.0] and 0.9 cases [95% CI, 0.8–1.0] per 100,000 in men and women, respectively), Hispanic and Pacific Islander men (3.2 cases [95% CI, 3.0–3.5] and 2.7 cases [95% CI, 1.5–4.4] per 100,000, respectively) experienced greater EAC

incidence than other non-White racial and ethnic groups. ESCC incidence was highest among NHB (4.1 cases [95% CI, 3.6–4.5] and 1.8 cases [95% CI, 1.6–2.1] per 100,000 in men and women, respectively) and South Asian (3.2 cases [95% CI, 2.1–4.5] and 2.0 cases [95% CI, 1.2–3.0] per 100,000 in men and women, respectively) Americans, and exceeded ESCC incidence among NHW Americans (1.3 cases [95% CI, 1.2–1.4] and 0.8 cases [95% CI, 0.7–0.8] per 100,000 in men and women, respectively).

General Comparison of GC, CRC, and EC Incidence by Race, Ethnicity, and Sex

The comparison of age-adjusted incidence rates of GC, CRC, and EC are illustrated in Figure 2A, while Figure 2B illustrates the age-adjusted incidence rates of site-specific GC and CRC, and histology-specific EC. Overall, the incidence of CRC surpassed that of GC in all races and ethnicities (Figure 2A). Notably, site-specific analysis revealed that the incidence of noncardia GC approached that of rectal cancer among Chinese, Vietnamese, and Southeast Asian Americans (Figure 2B). Among Korean Americans, noncardia GC incidence (18.7 cases [95% CI, 17.0–20.5] per 100,000) exceeded rectal cancer incidence (11.4 cases [95% CI, 10.1–12.7] per 100,000). And, among Korean American men specifically, noncardia GC incidence (25.5 cases [95% CI, 22.5–28.8] per 100,000) paralleled and even slightly exceeded colon cancer incidence (22.4 cases [95% CI, 19.6–25.5] per 100,000) (Figure A2), and approached combined CRC incidence (36.1 cases [95% CI, 32.6–39.9] per 100,000) (Figure A1).

The incidence of noncardia GC was higher than EC in Hispanic, Chinese, Japanese, Vietnamese, and Korean American men, with Korean American men having the greatest magnitude of differential incidence (25.5 noncardia GC vs 3.9 EC cases per 100,000). Similarly, NHB, Hispanic, Chinese, Japanese, and Filipino American women experienced a greater incidence of noncardia GC vs EC. EC and GC incidence were similar only in NHW (Figure A1).

Subgroup Analysis: Age 50 Years or Older

Age-adjusted incidence rates of site-specific GC, CRC, and histology-specific EC for individuals 50 years or older stratified by race and ethnicity and by sex are illustrated in Figure A3A–C. When compared to the primary analysis cohort aged 20 years or older, the patterns were similar overall, but with a generally more pronounced magnitude. As in the 20+ years-old group, among Korean American men aged 50 years or older, noncardia GC incidence exceeded colon cancer incidence (63.1 cases [95% CI, 55.4–71.6] vs 54.8 cases [95% CI, 47.8–62.7] per 100,000), and surpassed rectal cancer incidence (31.2 cases [95% CI, 26.1–37.0] per 100,000).

Discussion

In this population-based analysis of incident GI cancers, we compared the burden of GC, CRC, and EC across the most populous racial and ethnic groups in the US and identified significant differences that may ideally inform and further motivate targeted GI cancer prevention and control programs. We selected these 3 GI cancers *a priori* since they each have identifiable premalignant stages and endoscopic screening and surveillance are known to offer a reasonable approach to cancer prevention and detection at an early stage when curative options still exist. We call particular attention to the very high incidence rates of noncardia GC in certain groups. Our findings extend the current body of literature[26] by providing detailed incidence rates according to anatomic subsite and histology, particularly among disaggregated Asian American ethnicities based on country of origin.

Herein, and consistent with prior studies, we demonstrated markedly elevated incidence rates of noncardia GC among non-White racial and ethnic groups compared to NHW Americans,[18,27–29] with these rates far exceeding EC rates. CRC exceeded EC and GC in all groups, with the notable exception that noncardia GC among Korean American men paralleled and slightly exceeded colon cancer incidence rates. The recommendation during the predefined study interval (2010–2014) that all asymptomatic patients at average-risk initiate CRC screening at age 50 years old (now updated to age 45 years old) most certainly impacts CRC incidence and shifts CRC diagnoses to earlier-stage cancers, which, due to lack of symptoms, might otherwise not be diagnosed in the absence of these population-based screening programs. By contrast, GC incidence is likely *underestimated* since early-stage GCs, which are often asymptomatic or present with vague nonspecific symptoms, may go undiagnosed in the absence of systematic screening among at-risk populations in the United States. Indeed, over 65% of GCs in the US are diagnosed at an advanced stage and underlies in large part the dismal overall 5-year survival for GC in the United States.[16] While 5-year survival rates exceed 95% for early-stage GC after resection, early-stage GC, unfortunately, comprise only 15% of all GCs diagnosed in the United States.[16,30] This is in distinct contrast to countries with established GC screening programs, such as Japan and South Korea, where early-stage GCs now comprise the majority of GC diagnoses.[16] Indeed, in these countries, GC screening programs have translated into substantial reductions in GC-associated mortality.[16] While the highest noncardia GC incidence rates were in Asian Americans, Hispanic Americans also experienced a significant disproportionately higher incidence compared to NHW Americans. Recent studies have demonstrated a concerning trend of rising rates of advanced-stage noncardia GC among Hispanic Americans aged 50 years and younger.[31,32]

Current US screening practices for CRC and EC allow for a higher number of cancers diagnosed in an early stage before clinical symptoms, as well as diagnosis of their respective cancer precursors (eg colorectal adenomas, Barrett's esophagus) which further identifies someone has high risk. Current EC screening guidelines,[3,10] which are focused on early diagnosis of EAC or EAC precursors in NHW men,

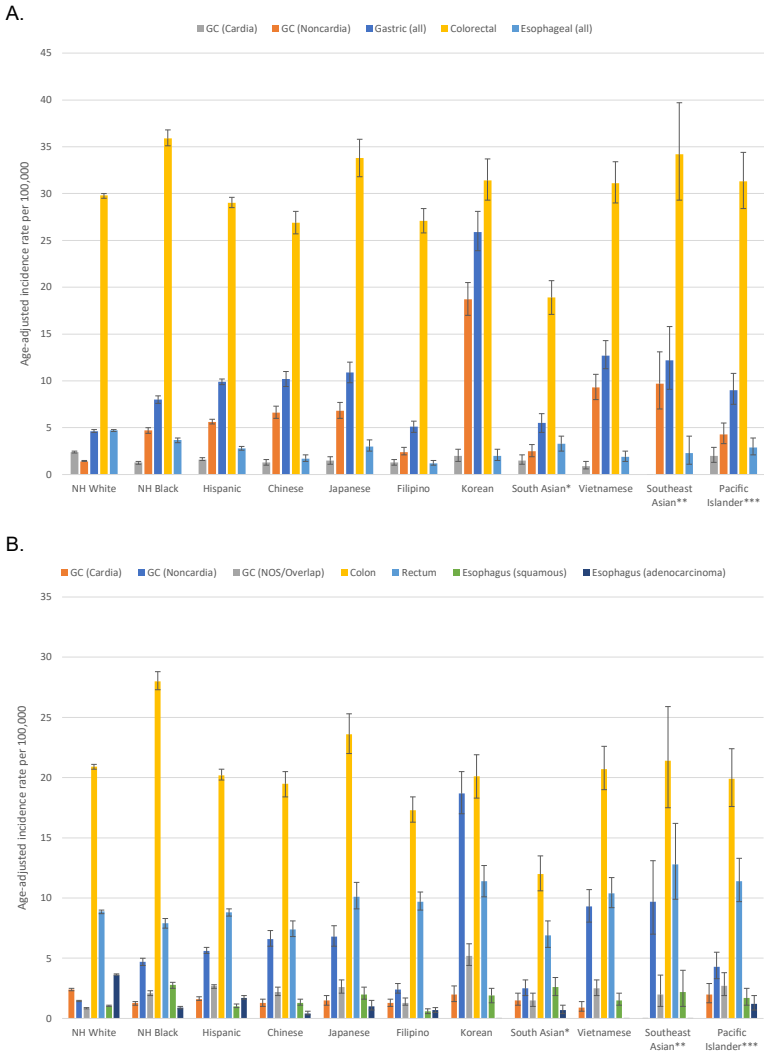

Figure 2. Age-adjusted incidence rates (per 100,000 person-years) of (A) site-specific GC, GC, CRC, EC (B) site-specific GC and CRC, and histology-specific EC, according to race and ethnicity among individuals aged 20 years or older. Corresponding 95% CIs are illustrated as black vertical bars. Incidence rates could not be calculated for certain cancers in less populous Asian ethnic groups due to too few cases (eg EAC in Southeast Asian Americans), and therefore appear as missing bars. *South Asian includes Asian Indian and Pakistani. **Southeast Asian includes Laotian and Kampuchean. ***Pacific Islander includes Hawaiian, Gaumanian, Chamorro, Samoan.

do not address the disproportionate burden of EC observed in NHB, Japanese, and South Asian Americans.[3] Consistent with prior findings, we also identified differences in EC histology based on race and ethnicity.[33] For example, while NHW Americans had the highest incidence of EAC, Hispanic Americans also had significantly elevated rates compared to other non-White groups. In contrast, NHB populations and some Asian American ethnic groups had the highest rates of ESCC, whereas NHW Americans had among the lowest. These findings merit special recognition because of differences in risk factors based on ESCC vs EAC histology—for example, longstanding gastroesophageal reflux disease and obesity being primary risk factors for EAC but not ESCC—as well as differences in endoscopic techniques for diagnosis and treatment of these EC histologic types or precursors.[33]

Regarding CRC, previous studies have consistently demonstrated that NHB Americans experience the greatest CRC incidence while Asian Americans and Pacific Islanders experience the lowest incidence.[26,33,34] Our findings demonstrate a rate of CRC in Japanese American and Pacific Islander men that actually paralleled and even slightly *exceeded* the incidence in NHB men. This is an important finding that might have been obscured in prior studies analyzing Asian groups in aggregate. From the vantage point of cancer risk specifically, this further underscores the need to analyze cancer data for ethnically disaggregated Asian Americans, given their differences in cultural practices, diet, and lifestyle, among other clinically relevant factors.[35]

Our results highlight an opportunity to address a stark disparity in the approach to guidelines surrounding opportunistic GI cancer screening for EC vs GC. Screening for EAC and Barrett's esophagus is recommended for essentially all NHW men over age 50 years old.[3,10] Yet, Hispanic, Chinese, Japanese, Korean, Vietnamese, and Southeast Asian men have similar or higher rates of noncardia GC, yet there are no recommendations for GC screening in these groups. To improve health equity in GI cancer screening and prevention, guideline support for individuals at increased risk for GC could help ensure that all individuals who are at elevated risk for upper GI cancers have an equal chance to benefit from endoscopic screening.

This study was not designed to identify the etiologies and mechanisms driving the observed differences in GI cancer incidence. That said, there is certainly an interplay

between potentially modifiable factors related to diet, level of acculturation, and lifestyle choices, such as smoking, and nonmodifiable host genetic factors.[36] Future research should ideally move away from race and ethnicity alone as a surrogate "catch-all" marker of risk—instead, we need to understand factors driving the differential cancer risk observed independent of race and ethnicity alone.[37]

The strengths of our study include the use of a national, population-based cancer registry to provide a robust and contemporary analysis of GI cancer rates by anatomic subsite and by race and ethnicity inclusive of Asian Americans according to ethnic country of origin. Our study also has limitations. As noted previously, our *a priori* decision to use SEER-9 registries ensured that our data were as accurate as possible and encompassed the most updated data for disaggregated racial and ethnic groups. We are unable to comment on 5-year cumulative incidence rates outside of the time period of this study, January 1, 2010, through December 31, 2014. Similar to other cancer registry analyses, our data do not include some individual-level information related to pertinent risk factors such as smoking, obesity, diet, *H. pylori* status, immigration details (eg age at immigration, countries of origin), or participation in cancer screening programs (eg colonoscopy, noninvasive stool testing). Small case counts for cardia GC and EC in certain groups, such as Southeast Asian populations, limited the ability to provide a comparative analysis across the GI cancer spectrum for these groups. We were unable to dissect incidence trends by immigration status or country of origin, as this information was absent or incomplete.[38] Data disaggregated according to Hispanic and NHB ethnic groups based on origin country also were not available. Each of these considerations requires future investigation, which is time-sensitive, given the health implications for immigrants and their descendants, especially Asian and Hispanic Americans.[17,21]

In conclusion, our study provides a comprehensive analysis of key differences in the epidemiology of screenable GI cancers across major racial and ethnic groups in the US and confirms that there is substantial opportunity for targeted attenuation efforts of these cancers. There are no comparative studies examining the impact of endoscopic screening vs no screening on GC-related morbidity and mortality in the US[39–41]—despite GC being potentially curable when diagnosed early.[40] There are also no studies evaluating the role of ESCC screening in higher-risk US populations, which may stem from a lack of awareness of the burden of these cancers in non-White populations. Moreover, there is a major unmet opportunity to increase participation in current screening programs and other preventative efforts for CRC and EAC. When considering that Asian and Hispanic Americans are expected to become the 2 largest immigrant groups in the US over the next few decades,[21] the unmet need for improved GI cancer prevention and early detection efforts is clear. The data presented herein serve as further evidence that the public health implications are potentially enormous if we do not meaningfully address the continued burden of these preventable cancers.

Supplementary Materials

Material associated with this article can be found in the online version at https://doi.org/10.1016/j.gastha.2024.01.005.

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Received May 22, 2023. Accepted January 8, 2024.

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Conflicts of Interest:
These authors disclose the following: Samir Gupta has paid consulting with Guardant Health, InterVenn, and Geneoscopy; stock options with CellMax Life; and research support from Freenome and Epigenomics. Steven H. Itzkowitz has consulting fees from Exact Sciences and Geneoscopy, and research support from Exact Sciences and Freenome. Shailja C. Shah receives ad hoc consulting fees and has served as an advisory board participant for Phathom Pharmaceuticals and RedHill Biopharma. The remaining authors disclose no conflicts.

Funding:
The authors declare the following grant support: Christina P. Wang receives research salary support from the National Cancer Institute of the National Institutes of Health under Award Number T32CA225617. Shailja C. Shah receives research salary support from an American Gastroenterological Association Research Scholar Award and Veterans Affairs Career Development Award (ICX002027A). The content is solely the responsibility of the listed authors and does not necessarily represent the official views of the funding agencies listed.

Ethical Statement:
This study was determined to be exempt from review by the Institutional Review Board of the Icahn School of Medicine at Mount Sinai.

Data Transparency Statement:
Upon reasonable request of the corresponding author, the data, methods, and materials for this study may be made available.

Reporting Guidelines:
STROBE.