



OPEN Unmasking inequalities in gastrointestinal cancer outcomes among Asian American subpopulations

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Globally, gastrointestinal (GI) cancer burden is higher in Asian populations. Asian Americans are commonly aggregated into a single category, potentially masking disparities. This study compared mortality from GI cancers among Asian American subpopulations to White patients. Mortality data (2018–2023) was collected from Centers for Disease Control Wide-ranging Online Data for Epidemiologic Research which included White and Asian subgroups: Indian Americans, Chinese, Filipino, Japanese, Korean, and Vietnamese. Deaths from all causes and GI cancers (esophagus, stomach, small intestine, colon, rectal, anal, hepatobiliary, and pancreas) were analyzed. Proportional mortality (PM) was calculated as cancer deaths divided by all deaths. During the study period, there were 425,162 total deaths and 34,167 deaths from GI cancers among the Asian American population in the United States, compared to 14,066,027 total deaths and 713,638 deaths from GI cancers among the White population (PM 8.0% vs. 5.1%, $p < 0.001$). Among Asian American women, the largest disparities in PM were observed in patients with stomach (1.0% vs. 0.2%, $p < 0.001$) and hepatobiliary cancers (1.7% vs. 0.7%, $p < 0.001$) relative to White women. Similarly, among Asian American men, the largest disparities were also observed in stomach (1.1% vs. 0.3%, $p < 0.001$) and hepatobiliary cancers (2.7% vs. 1.1%, $p < 0.001$). Anal cancers were the only GI cancer for which Asian American women (0.02% vs. 0.07%) and men (0.02% vs. 0.04%) had lower PMs compared to the White population. Asian Americans experience greater mortality from GI cancers compared to white patients. The largest differences in PM were observed in stomach and hepatobiliary cancers across both male and female populations and all age categories. Culturally competent strategies that tailor screening guidelines and cancer prevention efforts to the unique risk profiles of Asian American subpopulations are desperately needed.

Keywords Asian American, Gastrointestinal cancer, Proportional mortality, Cancer disparities, Korean American, Cultural competency

Disparities in cancer outcomes for Black and Hispanic patients have been well-documented^{1,2}. This increased attention has led to increased studies and efforts to reduce the disparities for these groups in recent years³. However, potential disparities in cancer outcomes for the over 24 million Asian Americans remain understudied⁴. The diverse ethnic populations within Asia, with cultural differences leading to differences in exposure and risk, have led to significant epidemiological shifts in gastrointestinal (GI) cancer burden in this heterogeneous population⁵. Despite these epidemiological differences, Asian American populations are often studied as a single, homogenous group, limiting insights into specific cancer risks. Foreign born Asian Americans, which make up over half of the Asian American population and likely has distinct cultural practices compared to American born Asians, further complicate investigative efforts⁶.

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GI cancers account for more than 25% of the total tumor burden and 35% of total mortality attributed to cancers worldwide⁷. Despite their lethality, most of these cancers are curable if found at an early stage. Over the past decade, large increases in the incidence of GI cancers have been noted across the world, including in Asia⁸. The rising GI cancer burden among Asian populations and convention of grouping all Asian Americans together create a desperate need for in-depth studies of GI cancer outcomes in each Asian American subpopulation. Thorough investigations of cancer trends in the past have led to successful public health initiatives, such as the lowering of recommended colonoscopy screening age⁹ in response to a noted increase in young onset colorectal cancer¹⁰. It is similarly possible that by considering the heterogeneity of the Asian American population, culturally competent screening, treatment, and follow up strategies can be individually tailored for these patients.

In 2018, the Centers for Disease Control and Prevention Wide-Ranging Online Data for Epidemiologic Research (CDC-WONDER) database began including Asian American subpopulation groups in their data reporting. Instead of a single category “Asian American”, there is now data differentiating between Indian American, Chinese, Filipino, Japanese, Korean, Vietnamese, Guamanian, Samoan, Other Pacific Islander, and Other Asian populations. This effort has made it possible to investigate disparate disease burdens on various Asian American subpopulations¹¹. This study’s objective was to examine how specific GI cancers differentially affect Asian American subpopulations stratified by age.

Materials and methods

Data source

The CDC-WONDER database was queried to obtain mortality data from 2018 to 2023. This study was exempt from Institutional Review Board review due to use of deidentified, publicly available data.

Study population

Adult patients (≥ 18 years old) were included. The study population only included Non-Hispanic or Latino ethnicities, and race categories included non-Hispanic White and Asian American subgroups (Indian American, Chinese, Filipino, Japanese, Korean, and Vietnamese). The population was stratified by male and female sex, as well as by age category (18–44, 45–64, and ≥ 65 years old). Since this study is focused specifically on Asian American subpopulations, other racial/ethnicity groups were not evaluated.

Data definitions and study outcomes

Deaths from all causes and from GI cancers specifically were captured. Death from subcategories of GI cancers (esophagus, stomach, small intestine, colon, rectal, anal, hepatobiliary, and pancreas) were also captured. Of note, CDC WONDER includes a subcategory “Malignant neoplasm of other and ill-defined digestive organs” that was included when calculating total GI cancer deaths, but was not included in the subcategory GI cancer analysis. This subcategory was defined as malignancy of unspecified part of intestinal tract, spleen neoplasms, overlapping lesions, or retroperitoneal and peritoneal neoplasms. Details on further GI cancer categories are shown in Supplemental Table 1.

Proportional mortality (PM) of each GI cancer was calculated for each race: *Proportional Mortality = Deaths from Specific GI Cancer / Deaths from All Causes*.

Proportional mortality ratios (PMR) compared the PM of each GI cancer in each Asian subpopulation to that of the White population: *Proportional Mortality Ratio = Proportional Mortality (of cancer in Asian subgroup) / Proportional Mortality (of cancer in White population)*.

Statistical analysis

Z tests, assuming normal distribution and sufficient sample size, were used to compare PMs from GI cancers in Asian subpopulations to that of the White population. A two-tailed significance value of $p < 0.05$ was used across all analyses. All analyses were conducted in Microsoft Excel, version 2412 (Microsoft Corporation, Armonk NY).

Results

From 2018 to 2023, there were 14,066,027 total deaths and 713,638 deaths from GI cancers among the White population, compared to 425,162 total deaths and 34,167 deaths from GI cancers among the Asian American population in the United states. The PM from GI cancers was significantly higher among Asian Americans compared to the White population (8.0% vs. 5.1%, $p < 0.001$). Among Asian Americans, GI cancers had the highest PM in Koreans (11.2%), followed by Vietnamese (9.9%) and Chinese patients (9.4%). Indian Americans (5.1%) had the lowest proportion of deaths attributable to GI cancers among Asian American subgroups (Fig. 1a). Stomach (PM 1.0% vs. 0.3%, $p < 0.001$) and hepatobiliary cancers (PM 2.2% vs. 0.9%, $p < 0.001$) disproportionately contribute to higher mortality burden among Asian Americans relative to the White population.

Mortality from GI cancers among Asian American women

Among Asian American women, the largest disparities in PM were observed in stomach and hepatobiliary cancers relative to White women (Fig. 1b). Korean, Vietnamese, and Chinese populations were most vulnerable to death from stomach or hepatobiliary cancers. Anal cancers was the only GI cancer for which all Asian American women subgroups, all ages combined, had lower PMs compared to the White population. Below is a breakdown of the of proportional mortality from various GI cancers among subgroups of Asian American women categorized by age groups.

Among 18–44 year old Asian American women, PM from any GI cancer was significantly higher in all subgroups compared to the White population ($p < 0.001$ for all) (Table 1; Fig. 2a). Within this group, the most

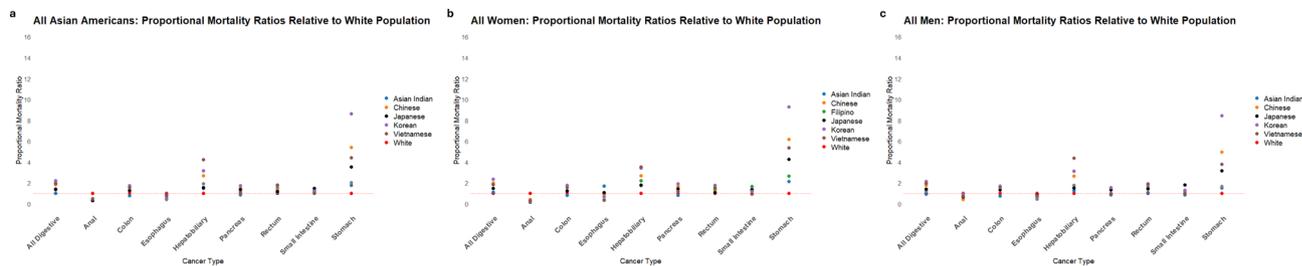


Fig. 1. Proportional mortality ratio of gastrointestinal cancers among all Asian Americans (a), Asian American women (b), and Asian American men (c) of all ages.

drastic disparities were observed in stomach cancer with all subgroups having significantly higher PM relative to White patients ($p < 0.001$ for all). The greatest PMRs were seen in Chinese (15.8), Vietnamese (12.3) and Korean (10.4) women. For colon cancer, all Asian American subgroups except Korean Americans had significantly higher PM compared to 18–44 year old White women. There were no significant differences in PM for esophagus, small intestine, and anal cancers across all Asian American subgroups relative to 18–44 year old White women.

Among 45–64 year old Asian American women, PM from any GI cancer was significantly higher in all subgroups compared to the White population ($p < 0.001$ for all) (Table 1; Fig. 2b). Similarly, the greatest differences were observed in stomach cancer with all subgroups having significantly higher PM relative to White patients ($p < 0.001$ for all). The largest PMRs were observed in Korean (13.6), Chinese (8.7), and Vietnamese (7.5) women. PM from hepatobiliary cancers were significantly higher for all Asian American subgroups in 45–64 year old women ($p < 0.001$ for all). For colon cancer, all Asian American subgroups except Indian Americans had significantly higher PM compared to 45–64 year old White women. Esophagus, small intestine, and anal cancers had similar PMs in Asian American women compared to 45–64 year old White women, likely due to the lower incidence of these cancers.

Among 65+ year old Asian American women, PM from any GI cancer was significantly higher in all subgroups compared to the White population, except for Indian Americans (Table 1; Fig. 2c). Stomach cancer most disproportionately affected Asian American women this age as well, with significantly higher PMs relative to White patients in all subgroups ($p < 0.01$ for all). The largest PMRs were seen in Korean (8.3), Chinese (5.3), and Japanese (4.4) women. Second to stomach cancers, hepatobiliary cancers had large disparities with significantly higher PMs compared to 65+ year old White women across all subgroups ($p < 0.001$ for all). In colon cancer, all subgroups had significantly higher PMs, except for Indian Americans who had a significantly lower PM relative to 65+ year old White women. This was similarly seen in pancreatic cancer, with significantly higher PMs observed in all subgroups except for Indian Americans, who had a significantly lower PM. For anal cancers, all subgroups of 65+ year old Asian American women had lower PM relative to their White counterparts ($p < 0.05$ for all).

Mortality from GI cancers among Asian American men

For all Asian American men, the largest disparities in PM were observed in stomach and hepatobiliary cancers (Fig. 1c). Korean, Vietnamese, and Chinese populations had the highest proportion of deaths from stomach or hepatobiliary cancers. Anal cancers was the only GI cancer for which all Asian American men groups, all ages combined, had lower PMs compared to the White population. Below is a breakdown of the of proportional mortality from various GI cancers among subgroups of Asian American men categorized by age groups.

Among 18–44 year old Asian American men, PM from any GI cancer was significantly higher in all subgroups compared to the White population ($p < 0.001$ for all) (Table 2; Fig. 3a). Within this group, the most drastic disparities were observed in hepatobiliary cancer with all subgroups having significantly higher PM relative to White patients ($p < 0.001$ for all). The greatest PMRs were seen in Chinese (13.2), Vietnamese (10.9), and Korean (7.1) men. All subgroups also had significantly higher PM in stomach cancers ($p < 0.001$ for all), with the highest PMRs seen in Japanese (10.3), Chinese (7.4), and Korean (5.2) men.

Among 45–64 year old Asian American men, PM from any GI cancer was significantly higher in all subgroups compared to the White population, except for Indian Americans which was significantly lower (Table 2; Fig. 3b). Within this cohort, all subgroups had significantly higher PMs in stomach cancer relative to White patients ($p < 0.001$ for all). The greatest PMRs were seen in Korean (8.0), Chinese (5.7), and Vietnamese (3.9) men. Second to stomach cancers, hepatobiliary cancers had large disparities with significantly higher PMs compared to 45–64 year old White men across all subgroups ($p < 0.01$ for all).

Among 65+ year old Asian American men, PM from any GI cancer was significantly higher in all subgroups compared to the White population, except for Indian Americans which was significantly lower (Table 2; Fig. 3c). Similarly, stomach cancer most disproportionately affected Asian American men with significantly higher PMs in all subgroups ($p < 0.05$ for all). The greatest PMRs were observed in Korean (8.9), Chinese (4.8), and Vietnamese (3.6) men. PM from hepatobiliary cancers were also significantly higher for all Asian American subgroups in 65+ year old men ($p < 0.001$ for all). In colon and rectum cancers, all subgroups except Indian American men had significantly higher PMs compared to 65+ year old White men. All subgroups had significantly lower PMs for esophageal cancers compared to 65+ year old White men ($p < 0.05$ for all).

Cancer ^a	Race ^b	Proportional mortality, % ^c				Proportional mortality ratio ^d
		Age group, y				
		18–44	45–64	65+	All	
All gastrointestinal	White	2.35	6.81	4.03	4.35	1.00
	Indian American	4.70	8.71	4.11	4.77	1.10
	Chinese	9.17	16.07	7.58	8.61	1.98
	Filipino	5.56	9.84	5.80	6.41	1.47
	Japanese	8.70	15.39	6.02	6.50	1.49
	Korean	5.66	19.59	9.04	10.19	2.34
	Vietnamese	8.31	13.92	6.91	8.03	1.85
Esophagus	White	0.08	0.39	0.20	0.23	1.00
	Indian American	0.13	0.60	0.37	0.38	1.70
	Chinese	0.07	0.29	0.20	0.20	0.90
	Filipino	0.18	0.13	0.07	0.08	0.36
	Japanese	0.00	0.80	0.21	0.24	1.07
	Korean	0.13	0.35	0.13	0.15	0.68
	Vietnamese	0.00	0.19	0.06	0.08	0.33
Stomach	White	0.20	0.33	0.18	0.20	1.00
	Indian American	1.16	1.10	0.27	0.43	2.15
	Chinese	3.15	2.86	0.96	1.25	6.17
	Filipino	0.73	0.94	0.45	0.54	2.65
	Japanese	1.74	1.84	0.80	0.86	4.27
	Korean	2.06	4.46	1.50	1.88	9.30
	Vietnamese	2.44	2.46	0.75	1.08	5.37
Small intestine	White	0.03	0.07	0.05	0.05	1.00
	Indian American	0.00	0.18	0.06	0.07	1.40
	Chinese	0.00	0.06	0.07	0.06	1.25
	Filipino	0.06	0.12	0.08	0.08	1.67
	Japanese	0.00	0.12	0.06	0.07	1.31
	Korean	0.00	0.11	0.06	0.06	1.18
	Vietnamese	0.00	0.03	0.05	0.05	0.93
Colon	White	1.07	2.11	1.22	1.33	1.00
	Indian American	1.93	1.80	0.90	1.08	0.81
	Chinese	3.01	4.65	2.00	2.34	1.75
	Filipino	2.18	3.51	1.33	1.69	1.27
	Japanese	3.91	4.78	1.44	1.63	1.22
	Korean	1.41	5.74	1.93	2.37	1.78
	Vietnamese	2.55	5.11	1.47	2.06	1.55
Rectum	White	0.24	0.47	0.19	0.23	1.00
	Indian American	0.52	0.52	0.17	0.24	1.06
	Chinese	1.05	0.63	0.23	0.30	1.32
	Filipino	0.73	0.58	0.26	0.32	1.43
	Japanese	0.87	0.61	0.22	0.24	1.07
	Korean	0.13	1.03	0.32	0.40	1.76
	Vietnamese	0.78	0.78	0.25	0.35	1.55
Anal	White	0.05	0.15	0.05	0.07	1.00
	Indian American	0.00	0.05	0.01	0.02	0.27
	Chinese	0.00	0.05	0.03	0.03	0.43
	Filipino	0.00	0.03	0.01	0.01	0.15
	Japanese	0.00	0.00	0.01	0.01	0.14
	Korean	0.00	0.04	0.01	0.01	0.19
	Vietnamese	0.11	0.03	0.01	0.02	0.29
Continued						

Cancer ^a	Race ^b	Proportional mortality, % ^c				Proportional mortality ratio ^d
		Age group, y				
		18–44	45–64	65+	All	
Hepatobiliary	White	0.33	1.10	0.66	0.70	1.00
	Indian American	0.52	2.50	1.13	1.28	1.82
	Chinese	1.18	3.31	1.71	1.88	2.67
	Filipino	0.79	1.79	1.54	1.55	2.21
	Japanese	0.43	2.15	1.19	1.24	1.75
	Korean	1.03	3.26	2.35	2.41	3.43
	Vietnamese	1.77	2.87	2.44	2.48	3.52
Pancreas	White	0.33	2.11	1.42	1.48	1.00
	Indian American	0.45	1.85	1.15	1.21	0.82
	Chinese	0.72	4.02	2.30	2.46	1.66
	Filipino	0.79	2.63	1.99	2.05	1.38
	Japanese	1.30	4.90	1.97	2.11	1.42
	Korean	0.90	4.50	2.68	2.84	1.92
	Vietnamese	0.55	2.15	1.76	1.77	1.19

Table 1. Proportional mortality from Gastrointestinal cancers among women in united States from 2018–2023, stratified by age group and race subgroup. ^aGastrointestinal cancers were identified as the underlying cause of death based on death certificates, and grouped as presented in the CDC-WONDER database. ^bRace and ethnicity were identified by the official signing death certificates or by the next of kin. ^cProportional mortality represents the percentage of deaths, among all deaths, attributable to the gastrointestinal cancer of interest in each age group. ^dProportional mortality ratio indicates the ratio of proportional mortality from a gastrointestinal cancer in a specific Asian American subpopulation relative to the proportional mortality in the non-Hispanic White population. Here, it is calculated from the proportional mortality of all age groups combined. Statistically significant differences ($p < 0.05$) in proportional mortality compared to the non-Hispanic White population are shown in bold.

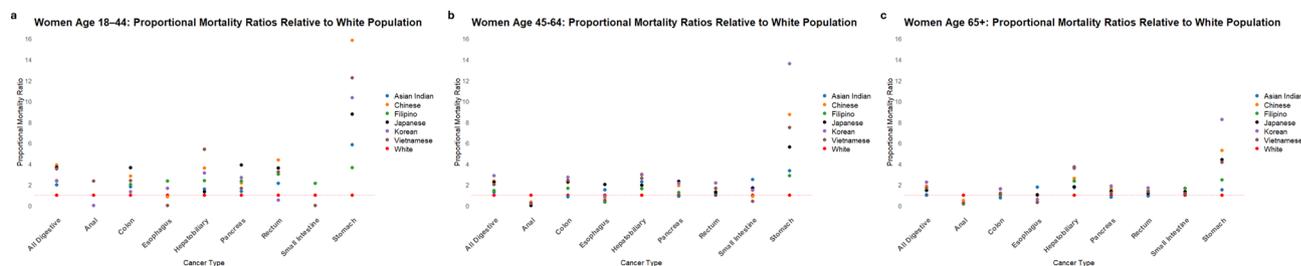


Fig. 2. Proportional mortality ratio of gastrointestinal cancers among Asian American women relative to their White counterparts, stratified by age category: (a) 18–44 years; (b) 45–64 years; (c) 65+ years.

Full data on all GI cancer PMs, stratified by sex, age category, and Asian American subpopulation are shown in Table 1, and 2. Absolute number of deaths in women and men were shown in Supplemental Tables 2 and 3, respectively.

Discussion

This study identifies disparate trends in gastrointestinal cancer mortality among Asian subpopulations relative to White patients. In Asian American women, the largest disparities were observed in stomach cancers across all age groups. Anal cancers was the only GI cancer where Asian American women across all subgroups had lower PMs compared to the White population. Among those 18–44 and 45–65 years old, Chinese, Vietnamese, and Korean women had the greatest PMs from stomach cancer, whereas for those 65+ years old, the largest PMs in stomach cancer were seen in Korean, Chinese, and Japanese women. In Asian American men, the largest disparities were observed in stomach or hepatobiliary cancers. Similarly to women, anal cancers was the only GI cancer where Asian American men had lower PMs compared to the White population. Hepatobiliary cancer most disproportionately affected Chinese, Vietnamese, and Korean men 18–44 years old. In contrast, stomach cancer had largest disparities among Chinese, Vietnamese, and Korean men 45–64 and 65+ years old. Identification of these disparities may provide the foundation for efforts towards culturally competent screening tools to address the disparate needs of the various subgroups within Asian Americans, rather than being treated as a monolith.

Cancer ^a	Race ^b	Proportional mortality, % ^c				Proportional mortality ratio ^d
		Age group, y				
		18–44	45–64	65+	All	
All gastrointestinal	White	1.76	7.88	5.51	5.75	1.00
	Indian American	3.05	7.11	5.01	5.25	0.91
	Chinese	7.19	17.68	8.90	10.12	1.76
	Filipino	4.08	10.16	6.41	7.05	1.23
	Japanese	7.98	13.36	7.41	8.10	1.41
	Korean	4.20	17.92	11.72	12.30	2.14
	Vietnamese	5.04	16.45	9.87	11.26	1.96
Esophagus	White	0.22	1.30	0.83	0.89	1.00
	Indian American	0.23	0.74	0.55	0.55	0.62
	Chinese	0.21	1.26	0.51	0.61	0.68
	Filipino	0.21	0.76	0.33	0.42	0.47
	Japanese	0.92	1.56	0.66	0.77	0.87
	Korean	0.14	0.74	0.50	0.52	0.58
	Vietnamese	0.20	1.21	0.54	0.69	0.78
Stomach	White	0.15	0.41	0.30	0.31	1.00
	Indian American	0.66	0.70	0.38	0.47	1.50
	Chinese	1.11	2.35	1.42	1.55	4.94
	Filipino	0.53	0.69	0.47	0.52	1.66
	Japanese	1.53	1.01	0.98	0.99	3.16
	Korean	0.77	3.31	2.66	2.65	8.45
	Vietnamese	0.66	1.62	1.07	1.18	3.78
Small intestine	White	0.02	0.07	0.06	0.06	1.00
	Indian American	0.00	0.07	0.05	0.05	0.84
	Chinese	0.09	0.13	0.06	0.07	1.14
	Filipino	0.04	0.07	0.06	0.06	0.99
	Japanese	0.00	0.21	0.10	0.11	1.81
	Korean	0.00	0.03	0.10	0.08	1.29
	Vietnamese	0.05	0.05	0.07	0.06	1.01
Colon	White	0.69	1.97	1.29	1.39	1.00
	Indian American	0.73	1.45	0.95	1.03	0.74
	Chinese	2.25	3.62	1.89	2.16	1.56
	Filipino	1.42	3.00	1.58	1.87	1.34
	Japanese	2.15	3.58	1.64	1.86	1.34
	Korean	0.84	4.08	2.11	2.37	1.71
	Vietnamese	1.32	3.35	1.77	2.15	1.55
Rectum	White	0.19	0.52	0.26	0.30	1.00
	Indian American	0.48	0.54	0.24	0.32	1.06
	Chinese	0.43	0.87	0.35	0.43	1.40
	Filipino	0.28	1.03	0.38	0.51	1.67
	Japanese	0.61	1.05	0.36	0.44	1.44
	Korean	0.35	1.18	0.46	0.58	1.91
	Vietnamese	0.25	1.15	0.38	0.57	1.87
Anal	White	0.02	0.07	0.03	0.04	1.00
	Indian American	0.03	0.00	0.02	0.02	0.46
	Chinese	0.04	0.04	0.01	0.02	0.43
	Filipino	0.00	0.03	0.03	0.03	0.76
	Japanese	0.00	0.00	0.03	0.02	0.65
	Korean	0.00	0.08	0.03	0.03	0.94
	Vietnamese	0.00	0.07	0.02	0.03	0.75
Continued						

Cancer ^a	Race ^b	Proportional mortality, % ^c				Proportional mortality ratio ^d
		Age group, y				
		18–44	45–64	65+	All	
Hepatobiliary	White	0.20	1.58	1.09	1.13	1.00
	Indian American	0.58	1.96	1.38	1.42	1.25
	Chinese	2.59	5.93	2.52	3.03	2.67
	Filipino	1.06	2.54	1.94	2.02	1.78
	Japanese	1.23	2.49	1.62	1.71	1.51
	Korean	1.40	5.09	3.38	3.55	3.13
	Vietnamese	2.14	7.10	4.42	4.97	4.38
Pancreas	White	0.26	1.89	1.58	1.56	1.00
	Indian American	0.25	1.61	1.39	1.32	0.85
	Chinese	0.47	3.41	2.03	2.17	1.39
	Filipino	0.46	1.88	1.55	1.55	0.99
	Japanese	1.53	3.41	1.94	2.10	1.34
	Korean	0.70	3.39	2.34	2.42	1.55
	Vietnamese	0.41	1.84	1.45	1.48	0.95

Table 2. Proportional mortality from Gastrointestinal cancers among men in united States from 2018–2023, stratified by age group and race subgroup. ^aGastrointestinal cancers were identified as the underlying cause of death based on death certificates, and grouped as presented in the CDC-WONDER database. ^bRace and ethnicity were identified by the official signing death certificates or by the next of kin. ^cProportional mortality represents the percentage of deaths, among all deaths, attributable to the gastrointestinal cancer of interest in each age group. ^dProportional mortality ratio indicates the ratio of proportional mortality from a gastrointestinal cancer in a specific Asian American subpopulation relative to the proportional mortality in the non-Hispanic White population. Here, it is calculated from the proportional mortality of all age groups combined. Statistically significant differences ($p < 0.05$) in proportional mortality compared to the non-Hispanic White population are shown in bold.

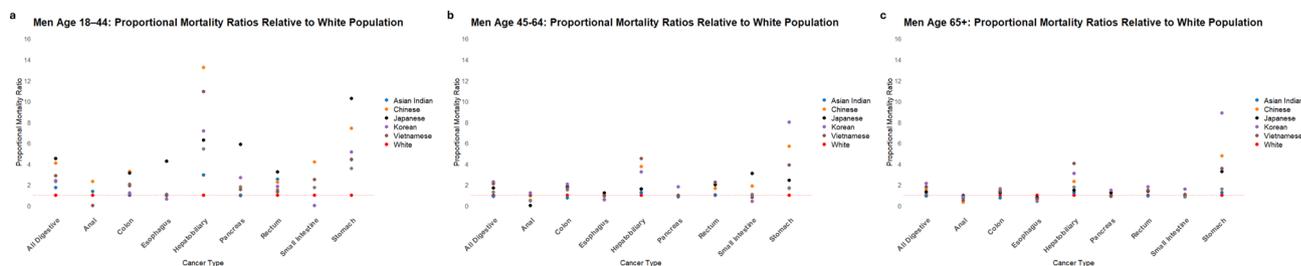


Fig. 3. Proportional mortality ratio of gastrointestinal cancers among Asian American men relative to their White counterparts, stratified by age category: (a) 18–44 years; (b) 45–64 years; (c) 65+ years.

Lifestyle changes in Asian countries as a result of rapid economic growth has been shown to be related to increased colon cancer burden⁸. While this focused on those living in Asia, it is plausible that lifestyle and cultural shifts similarly affect Asian Americans who have lived in Asia or have significant familial and cultural ties to their home countries. Dietary differences such as the prevalence of turmeric and ginger in Indian cuisine have been the subject of cancer research for potentially anticarcinogenic properties¹². High salt intake and frequent consumption of fermented foods, such as kimchi, have been associated with increased stomach cancer risk in Korean populations¹³. Similar dietary patterns among Korean Americans may at least partially explain the 8x greater mortality rate from stomach cancers relative to the White population. Korean Americans also have the highest PM of 11.2% for all GI cancers compared to 5.1% in White patients. Similar findings were recently reported by Mok et al., where significant disparities in gastric cancer burden were identified among Korean Americans¹⁴. Smoking is another lifestyle factor that is a well-established risk factor for various cancers. While prevalence of tobacco use has increased in Asian countries over the past decades¹⁵, prevalence among Asian Americans is lower than that of the general United States population¹⁶. This could explain the lower PMs in esophageal cancers observed among all Asian American subpopulations relative to their White counterparts¹⁷. Geographical exposures such as *Helicobacter pylori* could also explain the disparities we found in stomach cancer mortality, as *H. pylori* is both a known risk factor for gastric cancer and more prevalent in Asia^{14,18}. Similarly, Hepatitis B and Hepatitis C are more prevalent in Asia, which likely contributes to the increased PM for hepatobiliary cancers in all Asian American subgroups^{19,20}.

Psychosocial factors affecting Asian Americans such as immigration status, health literacy, education level, and language barriers may all influence the care they receive. It has been shown that these factors hamper healthcare access for Southeast Asians and lead to later-stage diagnoses and poorer outcomes^{21,22}. Conversely, South Asians tend to have higher socioeconomic status and therefore tend to be diagnosed with a more favorable prognosis^{23,24}. This aligns with our study, as Asian Americans of Southeast Asia heritage had higher PMs for combined all GI cancers, whereas Indian Americans were the only subpopulation with lower PMs relative to the White population. However, epidemiological findings regarding socioeconomic status should be interpreted with caution, and each individual patient's situation should be considered when assessing for barriers to care.

Genetic factors may also contribute to these observed disparities. For example, low penetrance genetic variants in *PSCA*, *PLCE1*, *PRKAA1*, and *MUC1* among Asian populations have been shown to increase the risk for gastric cancer²⁰. However, genetic differences contributing to GI cancer risk between Asian subpopulations remain understudied, and is necessary to comprehensively stratify risk and guide management strategy.

All this calls for culturally competent healthcare strategies for Asian American subpopulations when addressing cancer risk and management. We encourage targeted screening initiatives and health coaching based on subgroup risk and individual patient lifestyle factors. It is also known that different perspectives on health maintenance, prevention and screening, and treatment adherence are all ingrained in cultural norms that can greatly influence.

GI cancer outcomes in various Asian populations²⁵. Therefore, we also believe that understanding cultural norms and beliefs surrounding healthcare maintenance and management is crucial to improve adherence to physician recommendations. Disease prevention can consider dietary and lifestyle factors unique to Asian subpopulations. Counseling on dietary changes can be tailored towards each culture, such as inquiring about high intake of Kimchi or other pickled foods, which are both known risk factors for stomach cancers^{13,26}. Hepatitis screening for immigrants from Asia, or for those who frequently travel to Asia, may facilitate earlier identification of hepatobiliary cancers. Public health initiatives that target removing language barriers and supporting those with low health literacy could also have tremendous impacts on Asian American subgroups. In summary, an in-depth understanding of the diversity inherent to Asian American subpopulations can help guide disease prevention, screening, and treatment plans that are tailored to each unique subgroup. Recognizing individual risk factors and cultural background may unveil underlying risk factors that warrant earlier screening. To reduce GI cancer disparities, public health initiatives should prioritize culturally tailored prevention strategies, targeted screening efforts, and interventions to improve healthcare access among Asian American subpopulations²⁷.

Limitations

Epidemiological studies like this are limited in its generalizability to guide decision making for individual patients. However, we believe that our study still identified pertinent trends that can spur future efforts to investigate and advocate for culturally competent healthcare strategies. Comparing PMs between racial categories is also a proxy for disease prevalence, where the data can be biased due to underlying differences in overall death rates. However, we believe that the largest differences in PMs we highlighted still achieves the goal of bringing attention to this understudied topic, and setting the foundation for future investigations. Lastly, there are inherent limitations to national registry databases, such as missing/inaccurate data and selection bias. For example, it is possible that CDC-WONDER categorizes everyone from India, Pakistan, Bangladesh, and other countries of the Indian subcontinent as Indian American, where distinct cultural traditions and lifestyles separate the populations. Future investigations with more granular data could provide important insights. Studies comparing death rates of GI cancers among Asian American subpopulations and PMs in patients from their respective countries in Asia could further elucidate the predominant underlying drivers of these disparities. Comparisons of immigrant Asian Americans versus 1st generation, American born Asian Americans are also crucial to clarify the areas that would benefit from intervention.

Conclusion

Significant disparities in gastrointestinal cancer mortality exist among Asian American subpopulations relative to the White population. The largest differences in PM were observed in stomach and hepatobiliary cancers among Chinese, Korean, and Vietnamese patients across both male and female populations and all age categories. Lifestyle, cultural, and psychosocial factors may all play a role in these observed disparities. Future research should further investigate the biological, cultural, and socioeconomic determinants of these disparities. Culturally competent strategies that tailor screening guidelines and cancer prevention efforts to the unique risk profiles of Asian American subpopulations are desperately needed.

Data availability

All data used in this project is publicly available through the CDC WONDER database: <https://wonder.cdc.gov/deaths-by-underlying-cause.html>.

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Author contributions

C.W, D.A, and A.K conceptualized the project. C.W, D.A, D.H, M.S, K.S, J.R, C.E, D.M, S.F, and A.K helped with the study design and methodology. C.W and D.A created the tables/figures and wrote the main manuscript text. C.W, D.A, D.H, M.S, K.S, J.R, C.E, D.M, S.F, and A.K reviewed the manuscript.

Declarations

Competing interests

The authors declare no competing interests.

Additional information

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