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Racial and Ethnic Variation in the Incidence of Small Bowel Cancer Subtypes in the United States, 1995-2008

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Abstract

BACKGROUND—Small bowel cancer is uncommon and accordingly little is known about the epidemiology of this malignancy, especially by race and subtype.

OBJECTIVE—The objective of this analysis was to describe the distribution of small bowel cancer in the United States by demographic, pathologic, and clinical features.

DESIGN—This study was retrospective in design.

SETTING—Data from twenty-six population-based cancer registries in the United States from 1995 to 2008.

PATIENTS—Patients diagnosed with small bowel cancer (topography codes C17.0-17.3 and C17.8-17.9).

MAIN OUTCOME MEASURES—The primary outcomes measured were race- and histology-specific incidence (age-adjusted rate trends and age-specific rates) of small bowel cancer.

RESULTS—A total of 56,223 men and women diagnosed with small bowel cancer were identified. The overall age-adjusted incidence rates for small bowel cancer were 26.1 in men and 17.7 in women. Neuroendocrine tumors were the most common histological types of small bowel cancer in men and women, followed by carcinoma, lymphoma, and sarcoma. In comparison to whites, the rate of small bowel cancer was 42% greater in black men, 46% greater in black women, 34% lower in Asian-Pacific Islander men, and 37% lower in Asian-Pacific Islander women. Rates of small bowel cancer were 24% lower in Hispanic men and 15% lower in Hispanic women than rates in non-Hispanics. The excess small bowel cancer in blacks and the deficit in Asian-Pacific Islanders were attributable mainly to the incidence of adenocarcinoma and carcinoid

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Specific author contributions:

MTG was responsible for the designing and planning the study, YS and RKM were responsible for analyzing the data. All authors contributed to the interpretation of the data and drafting of the manuscript. MTG, YS, and RKM have each approved the final draft for submission.

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tumors. The incidence of gastrointestinal stromal tumor was significantly higher among Asian-Pacific Islanders.

CONCLUSIONS—This is one of the largest studies of small bowel cancer to date. These cancer registry data showed substantial racial and ethnic variation in the incidence of histological subtypes of small bowel malignancy that suggest possible etiologic diversity and/or disparities in detection.

Keywords

small bowel; cancer; descriptive study; incidence rates

Introduction

Small bowel malignancies are rare, accounting for less than half a percent of all malignancies and 1% to 2% of gastrointestinal neoplasms.¹ Accordingly, little is known about the epidemiology.^{2,3} The infrequency of these tumors is perplexing because the small intestine, which is made up of the duodenum, jejunum, and ileum, includes 90% of the mucosal surface area of the digestive tract; and cell turnover in this organ is rapid, enhancing susceptibility to carcinogens, especially from the bile and diet.⁴⁻⁶ Furthermore, the incidence of malignancy in adjacent digestive organs, the stomach and colon, is comparatively high.⁷ Symptoms of small bowel cancer are nonspecific and diagnosis difficult.⁸ This, combined with the aggressiveness of the tumor renders the 5-year relative survival probability poor in the U.S. at 59%.⁹

Geographic patterns of small bowel cancer indicate substantial international variation in the risk factors for this malignancy.¹⁰ Rates are high in North America, Northern Europe and Oceania; and lower in Eastern Europe, the Middle East, and various Asian, African, and Latin American countries, with the exception of Brazil. Men have higher rates of small bowel cancer compared to women in most countries. Blacks in the U.S. have among the highest rates of small bowel cancer in the world, although the reason for this is unclear.

Analytic studies of small bowel cancer have been small, with generally fewer than 100 cases, and inconclusive. Risk factors for small bowel cancer include autoimmune diseases, such as Crohn's disease, ulcerative colitis and celiac disease, familial adenomatous polyposis and Peutz-Jeghers syndrome, consumption of red meat, obesity, and various occupations.^{2,3,5-8} Reports of an association of tobacco smoking and alcohol consumption with risk of developing small bowel cancer are inconsistent.^{2,3}

In this analysis, we describe demographic and clinical features of small bowel cancer in the U.S. using information from cancer registries representing 66% of the population. An important objective was to monitor the reported increase in small bowel cancer, especially gastrointestinal stromal tumor (GIST) and carcinoid tumors, in a representative population-based study.

Methods

Sources of Data

Cancer registries in the U.S. that participate in the NCI's Surveillance, Epidemiology, and End Results (SEER) program or the CDC's Prevention's National Program of Cancer Registries contribute data annually to the North American Association of Central Cancer Registries (NAACCR). Data from each contributing registry are required to pass rigid quality criteria for completeness of reporting, nonduplication of records, internal consistency among data items, and low percentage of death certificate only cases.¹¹

NAACCR provided two data sets that were used in this analysis. The first file, Cancer Incidence in North America (CINA) Deluxe, was used in the analysis of race (white, black, American Indian-Alaska Native, Asian-Pacific Islander).¹¹ The second file, Cancer in U.S. Hispanics/Latinos, was used in the analysis of Hispanic ethnicity irrespective of race.¹² Only registries with data available for all 14 years from 1995 to 2008 were included in this analysis.

Qualifying states that participated through written consent represented 66% of the U.S. population, including 65% of the white population, 55% of the black population, 83% of the Asian-Pacific Islander population, 62% of the Alaska Native-American Indian population, and 88% of the U.S. Hispanic population. Although there were too few American Indian-Alaska Native cases (77 men and 48 women) to do some of the subgroup analyses, they were included as part of the total.

All cases of small bowel cancer meeting the NAACCR standards with International Classification of Diseases for Oncology¹³ topography codes C17.0-17.3 and C17.8-17.9 were included in the analytic file. Histology was defined as adenocarcinoma (morphologic codes 8140, 8144-45, 8201, 8210-11, 8255-63, 8310, 8323, 8441, 8452, 8460, 8480-81, 8490-8500), carcinoid tumor (morphologic codes 8153, 8156, 8240, 8241), sarcoma (8800-04, 8825, 8830, 8851-53, 8858, 8890-91, 8895-96, 8901, 8930, 8935-40, 8980, 8990, 9044, 9120, 9133-40), lymphoma (morphologic codes 9590-9659, 9663-9729, 9734, 9755, 9758, 9761, 9764, 9800-9920, 9948, 9970) and other (8000-01, 8004, 8590, 8680, 8720, 8730, 9050, 9052-53, 9064, 9100, 9364, 9473, 9540, 9560, 9930).

Statistical analysis

Initially, we created frequency distributions to characterize cases by the variables of interest including age, race, Hispanic ethnicity, and histology. Frequencies were compared between racial and ethnic groups by age and histology. Age-adjusted (AAIR) incidence rates were expressed per million population. All rates were age-adjusted by 5-year age groups to compare racial and ethnic groups by demographic, pathological, and clinical variables of interest.¹⁴ Confidence intervals for the rates were calculated by the method of Fay and Feuer, which is an exact method based on the gamma distribution and is particularly well-suited when cell counts are small.¹⁵ The 2000 U.S. population was used for age standardization. For all analyses, rates were suppressed when the category had fewer than 20 cases.

Incidence rate ratios (IRR), 95% confidence intervals (CI), and significance tests for the IRRs were calculated to assess patterns in cancer incidence.^{16,17} We examined differences in the log age-specific incidence rates separately by race and Hispanic ethnicity using the Poisson model. The annual percent change in rates between 1995 and 2008 was calculated to assess a trend in incidence rates. The statistical comparison of trends was based on the t-test of the trend regression parameter. All analyses were conducted using SAS version 9.2.

Results

Age-adjusted incidence rates by sex

A total of 30,569 men and 25,823 women were diagnosed with small bowel cancer between 1995 and 2008 (Table 1). Women experienced 32% lower rates of small bowel cancer than men (AAIR=17.7 per million for women and 26.1 per million for men), with the biggest male-to-female relative rate differences for lymphomas, especially Burkitt's lymphoma; and the smallest male-to-female differences for other specified carcinomas, hormone-specific carcinoid tumors, small cell neuroendocrine carcinoma and follicular B-cell lymphoma. Neuroendocrine tumors were the most common histological types of small bowel cancer in men and women, followed by carcinoma, lymphoma, and sarcoma (i.e. GISTs).

Age-adjusted incidence rates by race

The rate of small bowel cancer was 42% greater among black men than among white men; and 46% greater among black women than among white women (Table 2). By contrast, the rate of small bowel cancer was 34% lower among Asian-Pacific Islander men than among white men; and 37% lower among Asian-Pacific Islander women than among white women. A large part of the excess small bowel cancer among blacks compared to whites was attributable to the incidence of adenocarcinoma and carcinoid tumors. By contrast, rates for adenocarcinoma and carcinoid tumors were significantly lower among Asian-Pacific Islanders compared to whites of both sexes. The incidence of GIST was significantly more common among Asian-Pacific Islander men and women than the incidence among white men and women, respectively. Leiomyosarcoma was significantly less common among black women than among white women, but not significantly reduced among black men. The rates for B-cell lymphoma overall, particularly diffuse large B-cell lymphoma (DLBCL), follicular and marginal zone (women only) types were significantly lower among blacks than whites; whereas, the rates for follicular large B-cell lymphoma were significantly lower among Asian-Pacific Islanders than whites of both sexes, and marginal zone large B-cell lymphoma and T-cell lymphoma were significantly higher among Asian-Pacific Islander men than among white men.

Age-adjusted incidence rates by Hispanic ethnicity

The rate of small bowel cancer was 24% lower among Hispanic men than among non-Hispanic men (Table 3). Rates among Hispanic men also tended to be lower for most histologic types. In contrast, although the rate of small bowel cancer was 15% lower among Hispanic women than among non-Hispanic women, this was largely driven by relative rate differences for carcinoid tumors. Rates were similar between Hispanic and non-Hispanic women for most histological types. Relative rate differences between Hispanics and non-

Hispanics were greatest for carcinoid tumors and follicular large B-cell lymphoma for both sexes.

Trends by race or Hispanic ethnicity

During the 14-year period 1995-2008, the rate of small bowel cancer in the U.S. increased at a statistically significant annual rate for white (2.1%) and black (1.9%) men but not for Asian-Pacific Islander (0.4%) men (Figure 1A). Similarly, rates increased at a statistically significant annual rate for white (2.6%) and black (3.1%) women but not for Asian-Pacific Islander (0.2%) women (Figure 1B). The rate of small bowel cancer increased at a statistically significant annual rate for non-Hispanic (2.2%) men but not for Hispanic (0.8%) men (Figure 1C). However, rates increased at a statistically significant annual rate for both non-Hispanic (2.7%) and Hispanic (2.4%) women (Figure 1D).

Age-specific rates by race or Hispanic ethnicity

Age-specific rates for small bowel cancer were generally higher among males than females in all racial and ethnic groups (Figures 2A and 2B). Rates for small bowel cancer among Asian-Pacific Islanders generally exceeded that for whites and blacks from 5-9 years to 25-29 years at diagnosis. Blacks experienced the highest rates of small bowel cancer after age 25-29 years at diagnosis. Age-specific rates for duodenal cancer were similar for whites and Asian-Pacific Islanders, but much higher for all adult blacks (data not shown). By contrast, age-specific rates for cancer of the ileum were similar between blacks and whites, but much lower among Asian-Pacific Islanders. Race-specific rates for cancer of the jejunum were less distinct, but generally higher among blacks (data not shown). Non-Hispanic men and women generally had higher rates of small bowel cancer than did Hispanics, although the age-specific differences were more pronounced for men than for women (Figures 2C and 2D). Rates for duodenum cancer, but not jejunum or ileum cancers, were similar between Hispanics and non-Hispanics at all age groups; but rates among Hispanic women exceeded that among non-Hispanic women after the age 54 years (data not shown).

Trends by histology

During the 14-year period 1995-2008, the rate of small bowel cancer in the U.S. increased at a significant annual rate of 2.1% among men and 2.6% among women (Figure 3). The annual percent change in rates was greatest for GIST at 11.3% in men and 11.3% in women. After GIST, follicular B-cell lymphoma increased at a significant annual rate of 4.7% in men and 4.7% in women; neuroendocrine tumors increased at a significant annual rate of 4.9% in men and 5.3% in women; and sarcomas increased at a significant annual rate of 2.1% in men and (nonsignificant) 1.8% in women. The annual percent decrease in rates was greatest for leiomyosarcoma at -18.3% annually in men and -20.0% annually in women (data not shown). Significant declines in the rates of unspecified cancer were observed in both sexes.

Discussion

Our analysis of U.S. cancer registry data showed substantial racial and ethnic variation in the incidence of histological subtypes of small bowel malignancy, suggesting diverse cellular origins and etiologies. Although the rates of small bowel cancer among Asian-Pacific Islanders were generally lower than rates among whites, GIST was a notable exception. The significantly higher incidence of GIST among Asian-Pacific Islanders suggests a greater genetic susceptibility to GIST; however, mutations in tyrosine kinase c-kit (CD117) receptor activity, which is present in 85% of GISTs, appear to be associated with proliferation of GIST rather than carcinogenesis or malignant transformation.¹⁸ Therefore, it is possible that non-genetic factors may be contributing to higher rates of GIST observed in Asian-Pacific Islanders.

U.S. rates of GIST increased for both males (11.3%) and females (11.3%) during the 1995 to 2008 observation period, whereas the rates of leiomyosarcoma decreased for males (18.3%) and females (20.0%), likely a result of improved pathological differentiation between leiomyosarcomas and GIST.¹⁹ In the past, GIST were commonly misclassified as leiomyosarcomas but these two sarcomas can now be distinguished using immunohistochemistry.

Adenocarcinoma was the most common histologic type of small bowel cancer in the U.S. during the 1970s and 1980s.²⁰ However, by the 1990s, the incidence of carcinoid tumors, neuroendocrine cancers that accounted for 36% of tumors in the small bowel, surpassed that of adenocarcinoma.^{21,22} Carcinoids are heterogeneous gastroenteropancreatic tumors occurring most commonly in the ileum which is lined with neuroendocrine system cells that secrete various digestive hormones into the blood.²³ The most dramatic increase in the rates of carcinoid tumors was among blacks followed by whites. In contrast to blacks and whites, the incidence of adenocarcinoma in Asian-Pacific Islanders and Hispanics was higher than the incidence of neuroendocrine tumors. Rates of carcinoid tumors were particularly low among Hispanics compared to non-Hispanics, implying differences in disease epidemiology between these groups. Incidence-based mortality rate patterns were similar to incidence rate patterns (data not shown); therefore, we have not included them in the current study.

Our study is not without limitations. First, our analysis was restricted to registries with data for the entire 14-year study period. In a sensitivity analysis, incidence rates by race were similar for excluded and included registries, but tended to be lower for Hispanics in the excluded registries compared to Hispanics in the included registries (data not shown). However, because rates for Hispanics in the excluded registries were lower than those in the included registries, the true difference in the incidence rates between non-Hispanics and Hispanics is likely to be greater than what we observed in the current study. Second, our study was descriptive in nature and therefore does not provide definitive information regarding small bowel cancer etiology. Finally, information on histologic subtype was not determined in a centralized or standardized manner, and therefore subject to differences in diagnostic practices across the U.S. as well as changes in criteria over time. Despite these limitations, to our knowledge this is one of the largest studies of small bowel cancer to date; our data represented utilized high-quality population-based data covering 66% of the total

U.S. population, whereas prior studies have represented less than 14% of the total U.S. population. Furthermore, our study considered potential differences in age-adjusted incidence rate trends and age-specific rates by race/ethnicity and sex, as well as histology and sex, rather than each factor (race/ethnicity, histology, sex) alone.

The incidence of small bowel malignancy has continued to increase at an alarming pace in the U.S., although the cause is unknown and unlikely to be a result of improved detection as symptoms are vague. Of special concern is the high rate of small bowel cancer in black men and women, particularly rates of adenocarcinoma and carcinoid tumors. The relative rates of small bowel cancer in Asian-Pacific Islanders and Hispanics compared to whites and blacks were inconsistent across histological subtypes, underscoring the substantial etiologic heterogeneity of this malignancy. This heterogeneity poses a considerable challenge to future epidemiological research on small bowel cancer as it will likely be difficult to achieve sufficient sample sizes in the absence of pooled consortium-based studies.

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Figure 1.

Age-adjusted incidence rates for small bowel cancer in the United States, 1995–2008, by race or ethnicity and calendar year of diagnosis; x-axis: year of diagnosis, y-axis: rate per million. (A) Distribution for white, black and Asian-Pacific Islander men. (B) Distribution for white, black and Asian-Pacific Islander women. (C) Distribution for non-Hispanic and Hispanic men. (D) Distribution for non-Hispanic and Hispanic women.

Figure 2.

Age-specific incidence rates for small bowel cancer in the United States, 1995–2008, by race or ethnicity; x-axis: age (5-year groups) at diagnosis, y-axis: incidence rate per million. (A) Distribution for white, black and Asian-Pacific Islander men. (B) Distribution for white, black and Asian-Pacific Islander women. (C) Distribution for non-Hispanic and Hispanic men. (D) Distribution for non-Hispanic and Hispanic women.

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Figure 3.

Age-adjusted incidence rates for small bowel cancer in the United States, 1995–2008, by histologic type and calendar year of diagnosis; x-axis: year of diagnosis, y-axis: rate per million. (A) Distribution for men. (B) Distribution for women.

Table 1
Incidence of small bowel cancer by histologic type and sex, selected areas in the United States, 1995-2008.

Histological type	Males			Females			Females / Males		
	Count	AAIR	95% CI	Count	AAIR	95% CI	IRR	95% CI	
Total	30,569	26.1	25.8-26.4	25,823	17.7	17.5-17.9	0.68	0.67-0.69	
Carcinoma	9,885	8.6	8.5-8.8	8,621	5.8	5.7-5.9	0.67	0.65-0.69	
Adenocarcinoma	9,308	8.1	7.9-8.3	8,141	5.5	5.4-5.6	0.68	0.66-0.70	
Adenocarcinoma, NOS	7,216	6.3	6.2-6.5	6,322	4.3	4.2-4.4	0.67	0.65-0.70	
Mucinous adenocarcinoma	1,303	1.1	1.1-1.2	1,010	0.7	0.7-0.7	0.62	0.57-0.67	
Arising in adenoma	655	0.6	0.5-0.6	662	0.5	0.4-0.5	0.78	0.70-0.87	
Adenocarcinoma, other specified	134	0.1	0.1-0.1	147	0.1	0.1-0.1	0.84	0.66-1.07	
Carcinoma, other specified	35	0.03	0.02-0.04	41	0.03	0.02-0.04	0.92	0.57-1.49	
Carcinoma, NOS	542	0.5	0.4-0.5	439	0.3	0.3-0.3	0.61	0.54-0.70	
Neuroendocrine cancers	11,999	10.2	10.0-10.3	10,775	7.5	7.3-7.6	0.73	0.72-0.75	
Differentiated (carcinoids)	10,606	9.0	8.8-9.2	9,493	6.6	6.4-6.7	0.73	0.71-0.75	
Carcinoid, NOS	10,489	8.9	8.7-9.1	9,374	6.5	6.4-6.6	0.73	0.71-0.75	
Carcinoid, hormone specific	117	0.1	0.1-0.1	119	0.1	0.1-0.1	0.86	0.66-1.12	
Undifferentiated	1,277	1.1	1.0-1.1	1,170	0.8	0.8-0.9	0.76	0.70-0.82	
Large cell neuroendocrine carcinoma	1,201	1.0	1.0-1.1	1,099	0.8	0.7-0.8	0.76	0.70-0.82	
Small cell neuroendocrine carcinoma	22	0.02	0.01-0.03	25	0.02	0.01-0.02	0.87	0.47-1.63	
Atypical carcinoid tumor	54	0.1	0.03-0.1	46	0.03	0.02-0.04	0.67	0.44-1.01	
Mixed endocrine-exocrine	116	0.1	0.1-0.1	112	0.1	0.1-0.1	0.80	0.61-1.05	
Sarcoma	2,622	2.2	2.1-2.3	2,235	1.6	1.5-1.6	0.72	0.68-0.76	
Gastrointestinal stromal sarcoma	1,763	1.5	1.4-1.5	1,501	1.1	1.0-1.1	0.72	0.67-0.77	
Leiomyosarcoma	540	0.5	0.4-0.5	512	0.4	0.3-0.4	0.78	0.69-0.88	
Sarcoma, other specified	130	0.1	0.1-0.1	71	0.1	0.04-0.1	0.47	0.34-0.63	
Sarcoma, undifferentiated	189	0.2	0.1-0.2	151	0.1	0.1-0.1	0.67	0.54-0.83	
Lymphoma	5,634	4.8	4.7-4.9	3,874	2.7	2.6-2.7	0.55	0.53-0.58	
B-cell lymphoma	4,740	4.0	3.9-4.2	3,326	2.3	2.2-2.4	0.56	0.54-0.59	
Burkitt	329	0.3	0.2-0.3	66	0.1	0.0-0.1	0.18	0.14-0.24	
Large cell, diffuse	2,664	2.3	2.2-2.4	1,636	1.1	1.1-1.2	0.48	0.45-0.51	

Histological type	Males			Females			Females / Males		
	Count	AAIR	95% CI	Count	AAIR	95% CI	IRR	95% CI	IRR
Marginal zone	459	0.4	0.4-0.4	438	0.3	0.3-0.3	0.77	0.68-0.88	
Follicular	973	0.8	0.8-0.9	997	0.7	0.7-0.7	0.84	0.77-0.92	
Lymphoplasmatic	23	0.02	0.01-0.03						
Mantle cell	93	0.1	0.1-0.1	38	0.03	0.02-0.04	0.32	0.22-0.48	
Lymphocytic	91	0.1	0.1-0.1	73	0.1	0.0-0.1	0.62	0.45-0.86	
T-cell lymphoma	318	0.3	0.2-0.3	178	0.1	0.1-0.1	0.46	0.38-0.56	
Peripheral	194	0.2	0.1-0.2	99	0.1	0.1-0.1	0.41	0.32-0.53	
NK/other	124	0.1	0.1-0.1	79	0.1	0.0-0.1	0.54	0.41-0.73	
Hodgkin lymphoma	25	0.02	0.01-0.03						
Other lymphoma	711	0.6	0.6-0.7	431	0.3	0.3-0.3	0.48	0.43-0.55	
Other specified malignancies	93	0.1	0.1-0.1	50	0.04	0.03-0.1	0.46	0.32-0.66	
Melanoma	44	0.04	0.03-0.1						
Neuroepithelial and peripheral nerve sheath				22	0.02	0.01-0.02			
Unspecified malignancies	249	0.2	0.2-0.2	208	0.1	0.1-0.2	0.65	0.54-0.79	

NOTES: 1. NOS, not otherwise specified; NK, natural killer; AAIR, age-adjusted incidence rate; CI, confidence interval; IRR, incidence rate ratio. 2. Rates are per 1,000,000 and age adjusted to the 2000 U.S. standard population. Counts <20 are suppressed.

Table 2

Incidence of small bowel cancer by histologic type, race and sex, selected areas in the United States, 1995-2008.

Histological type	Males						Females					
	White			Black			White			Black		
	AAIR	AAIR	95% CI	IRR	AAIR	95% CI	AAIR	AAIR	95% CI	IRR	AAIR	95% CI
Total	25.6	36.4	1.37-1.48	1.42	17.0	0.62-0.72	17.2	25.2	1.41-1.52	10.8	0.63	0.58-0.68
Carcinoma	8.2	15.0	1.72-1.94	1.83	5.8	0.63-0.81	5.4	10.6	1.84-2.08	4.1	0.76	0.66-0.86
Adenocarcinoma	7.7	14.1	1.72-1.95	1.83	5.5	0.62-0.81	5.1	10.1	1.85-2.10	3.9	0.75	0.66-0.86
Adenocarcinoma, NOS	6.0	11.4	1.78-2.06	1.91	4.2	0.61-0.82	4.0	7.7	1.80-2.07	3.1	0.77	0.66-0.90
Mucinous adenocarcinoma	1.1	1.4	1.07-1.58	1.30	0.6	0.38-0.82	0.6	1.2	1.57-2.25	0.4	0.57	0.35-0.87
Neuroendocrine cancers	9.9	15.9	1.51-1.70	1.60	3.4	0.29-0.40	7.3	11.5	1.49-1.67	1.9	0.27	0.22-0.32
Differentiated (carcinoids)	8.7	14.4	1.55-1.76	1.65	2.9	0.27-0.39	6.4	10.2	1.49-1.69	1.6	0.25	0.21-0.31
Carcinoid, NOS	8.7	14.2	1.54-1.75	1.64	2.8	0.27-0.39	6.3	10.0	1.49-1.68	1.6	0.25	0.20-0.31
Undifferentiated	1.1	1.3	1.01-1.50	1.24	0.5	0.29-0.69	0.8	1.2	1.29-1.83			
Sarcoma	2.2	2.0	0.93-1.09	0.93	2.9	1.36-1.14-1.61	1.6	1.3	0.87-0.74-1.02	2.1	1.38	1.15-1.65
Gastrointestinal stromal sarcoma	1.4	1.2	0.86-0.70-1.04	0.86	2.3	1.61-1.31-1.94	1.0	0.9	0.87-0.71-1.05	1.6	1.58	1.27-1.94
Leiomyosarcoma	0.5	0.4	0.76-0.49-1.11	0.76			0.4	0.2	0.66-0.44-0.96	0.4	1.05	0.66-1.59
Lymphoma	4.9	3.2	0.65-0.57-0.73	0.65	4.7	0.95-0.82-1.09	2.8	1.6	0.57-0.49-0.65	2.4	0.88	0.74-1.04
B-cell lymphoma	4.2	2.5	0.61-0.53-0.70	0.61	3.9	0.93-0.79-1.08	2.4	1.2	0.52-0.44-0.61	2.1	0.89	0.73-1.06
Large cell, diffuse	2.4	1.4	0.61-0.51-0.73	0.61	2.4	1.02-0.83-1.24	1.1	0.6	0.48-0.37-0.61	1.2	1.02	0.79-1.30
Marginal zone	0.4	0.3	0.72-0.45-1.09	0.72	0.6	1.57-1.01-2.31	0.3	0.2	0.60-0.37-0.91	0.3	1.08	0.65-1.68
Follicular	0.9	0.4	0.41-0.27-0.59	0.41	0.5	0.59-0.38-0.88	0.7	0.3	0.44-0.32-0.61	0.5	0.62	0.40-0.90
T-cell lymphoma	0.3	0.3	1.02-0.64-1.54	1.02	0.5	1.75-1.06-2.73	0.1					

NOTES: 1. NOS, not otherwise specified; AAIR, age-adjusted incidence rate; CI, confidence interval; IRR, incidence rate ratio. 2. Incidence rates are per 1,000,000 and age adjusted to the 2000 U.S. standard population. Counts <20 are suppressed.

Table 3

Incidence of small bowel cancer by histologic type, Hispanic ethnicity and sex, selected areas in the United States, 1995-2008.

Histological type	Males				Females			
	Non-Hispanic		Hispanic		Non-Hispanic		Hispanic	
	AAIR	IRR	95% CI	AAIR	AAIR	IRR	95% CI	AAIR
Total	26.7	20.2	0.72-0.79	18.0	15.3	0.85	0.81-0.89	
Carcinoma	8.8	7.4	0.84	0.77-0.91	5.8	5.6	0.96	0.88-1.03
Adenocarcinoma	8.2	6.9	0.84	0.77-0.91	5.5	5.2	0.94	0.87-1.02
Adenocarcinoma, NOS	6.4	5.6	0.87	0.79-0.96	4.3	4.1	0.96	0.88-1.06
Mucinous adenocarcinoma	1.1	0.9	0.76	0.61-0.95	0.7	0.6	0.91	0.71-1.14
Neuroendocrine cancers	10.5	6.5	0.62	0.57-0.67	7.7	5.5	0.72	0.66-0.77
Differentiated (carcinoids)	9.3	5.7	0.62	0.56-0.67	6.7	4.9	0.73	0.67-0.79
Carcinoid, NOS	9.2	5.7	0.62	0.56-0.67	6.7	4.9	0.73	0.67-0.79
Undifferentiated	1.1	0.7	0.65	0.51-0.82	0.8	0.6	0.66	0.52-0.83
Sarcoma	2.2	1.9	0.87	0.76-1.00	1.6	1.4	0.92	0.79-1.06
Gastrointestinal stromal sarcoma	1.5	1.3	0.87	0.73-1.02	1.1	1.0	0.91	0.75-1.08
Leiomyosarcoma	0.5	0.4	0.83	0.58-1.14	0.4	0.3	0.81	0.57-1.12
Lymphoma	4.8	4.1	0.84	0.76-0.93	2.6	2.6	0.98	0.88-1.10
B-cell lymphoma	4.1	3.5	0.86	0.77-0.95	2.3	2.2	0.95	0.84-1.07
Large cell, diffuse	2.3	2.1	0.91	0.79-1.05	1.1	1.2	1.08	0.91-1.27
Marginal zone	0.4	0.3	0.85	0.59-1.20	0.3	0.4	1.24	0.89-1.68
Follicular	0.8	0.6	0.66	0.50-0.86	0.7	0.5	0.71	0.54-0.90
T-cell lymphoma	0.3	0.2	0.92	0.60-1.35	0.1			

NOTES: 1. NOS, not otherwise specified; AAIR, age-adjusted incidence rate; CI, confidence interval; IRR, incidence rate ratio. 2. Incidence rates are per 1,000,000 and age adjusted to the 2000 U.S. standard population. Counts <20 are suppressed.