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Introduction

Gastric cancer disproportionately affects racial and ethnic minorities in the U.S., with incidence and mortality rates more than two times higher in nonwhite populations than whites.

There are notable demographic and clinical differences in gastric cancer presentation across race/ethnicity, and several studies suggest differential survival across these groups. However, it is not clear if and how demographic and disease characteristics account for disparate survival in gastric cancer patients of different races.

Aims

- 1) To determine factors associated with survival in gastric cancer patients among four major racial/ethnic groups.
- 2) To estimate the association of race/ethnicity with survival in gastric cancer patients.
- 3) To examine differences in survival by race/ethnicity among subgroups of patients with shared demographic and clinical prognostic factors.

Methods

The California Cancer Registry was used to identify patients diagnosed with a first primary invasive epithelial gastric cancer between 2006 and 2015. Chi-square tests were used to compare the characteristics of non-Hispanic whites (NHWs, n=7,475), non-Hispanic blacks (NHBs, n=1,246), Hispanics (n=6,274), and Asians/Pacific Islanders (APIs, n=4,204).

Kaplan-Meier curves were used to compare overall survival by race/ethnicity. Cox proportional hazards regression was used to identify factors associated with overall survival in each racial/ethnic group. Survival was also compared across race/ethnicity within subgroups of demographic and disease factors. Age-adjusted five-year relative survival was calculated within subgroups.

Patient characteristics by race/ethnicity are summarized in Table 1. There were highly significant differences across groups for all demographic and disease factors (p<0.0001). Survival was poor for all groups, but overall, APIs had the most favorable survival at 38.1%, compared to 26.3%, 25.6%, and 22.7% for NHWs, Hispanics, and NHBs, respectively.

Table 1: Comparison of patients diagnosed with epithelial gastric cancer in California by race/ethnicity, 2006-2015 (n=19,199).

Variable	NHW N=7,475 N (%)	NHB N=1,246 N (%)	Hispanic N=6,274 N (%)	API N=4,204 N (%)
Sex				
Male	5092 (68.1)	718 (57.6)	3581 (57.1)	2389 (56.8)
Female	2383 (31.9)	528 (42.4)	2693 (42.9)	1815 (43.2)
Age at Diagnosis				
20-49 years	605 (8.1)	154 (12.4)	1481 (23.6)	486 (11.6)
50-69 years	3347 (44.8)	567 (45.5)	2758 (44.0)	1691 (40.2)
70+ years	3523 (47.1)	525 (42.1)	2035 (32.4)	2027 (48.2)
Neighborhood Socioeconomic Status				
Lowest	733 (9.8)	372 (29.9)	2224 (35.4)	546 (13.0)
Lower-Middle	1316 (17.6)	332 (26.6)	1635 (26.1)	788 (18.7)
Middle	1638 (21.9)	219 (17.6)	1125 (17.9)	830 (19.7)
Upper-Middle	1809 (24.2)	180 (14.4)	787 (12.5)	958 (22.8)
Highest	1691 (22.6)	100 (8.0)	332 (5.3)	941 (22.4)
Unknown	288 (3.9)	43 (3.5)	171 (2.7)	141 (3.4)
Marital Status				
Single/Divorced/Widowed	2807 (37.6)	724 (58.1)	2419 (38.6)	1272 (30.3)
Married/Domestic Partner	4392 (58.8)	444 (35.6)	3624 (57.8)	2797 (66.5)
Unknown	276 (3.7)	78 (6.3)	231 (3.7)	135 (3.2)
Insurance				
Private	3318 (44.4)	484 (38.8)	2430 (38.7)	1638 (39.0)
Medicare	3163 (42.3)	461 (37.0)	1761 (28.1)	1785 (42.5)
Other Public	724 (9.7)	248 (19.9)	1569 (25.0)	586 (13.9)
None	106 (1.4)	25 (2.0)	354 (5.6)	135 (3.2)
Unknown	164 (2.2)	28 (2.2)	160 (2.6)	60 (1.4)
Site				
Cardia	3538 (47.3)	183 (14.7)	934 (14.9)	519 (12.3)
Noncardia	2588 (34.6)	743 (59.6)	3645 (58.1)	2822 (67.1)
Overlapping/Unspecified	1349 (18.0)	320 (25.7)	1695 (27.0)	863 (20.5)
Histology				
Intestinal	4922 (65.8)	781 (62.7)	3338 (53.2)	2679 (63.7)
Diffuse	1533 (20.5)	298 (23.9)	2099 (33.5)	1166 (27.7)
Other Epithelial	1020 (13.6)	167 (13.4)	837 (13.3)	359 (8.5)
Stage at Diagnosis				
Localized	1972 (26.4)	319 (25.6)	1433 (22.8)	1218 (29.0)
Regional	2376 (31.8)	373 (29.9)	1923 (30.7)	1524 (36.3)
Remote	3127 (41.8)	554 (44.5)	2918 (46.5)	1462 (34.8)

Predictors of survival were generally similar for each race/ethnicity. Older age, being unmarried or uninsured, and having a cardia tumor or diffuse histology was associated with worse survival in all groups.

Overall, APIs (HR=0.83, 95% CI: 0.79, 0.88, p<0.0001) and Hispanics (HR=0.94, 95% CI: 0.90, 0.99, p=0.0104) had better survival than NHWs, but NHBs and NHWs did not have different prognosis (HR=1.06, 95% CI: 0.98, 1.15, p=0.2237) (Table 2). The survival advantage of APIs persisted in nearly every demographic and disease subgroup, but Hispanics and NHBs had similar survival as NHWs in most groups. Race was not a significant predictor of survival among those with public or no insurance and patients with cardia tumors.

Results

Figure 1. Kaplan-Meier curves comparing overall survival among patients with epithelial gastric cancer by race/ethnicity, 2006-2015.

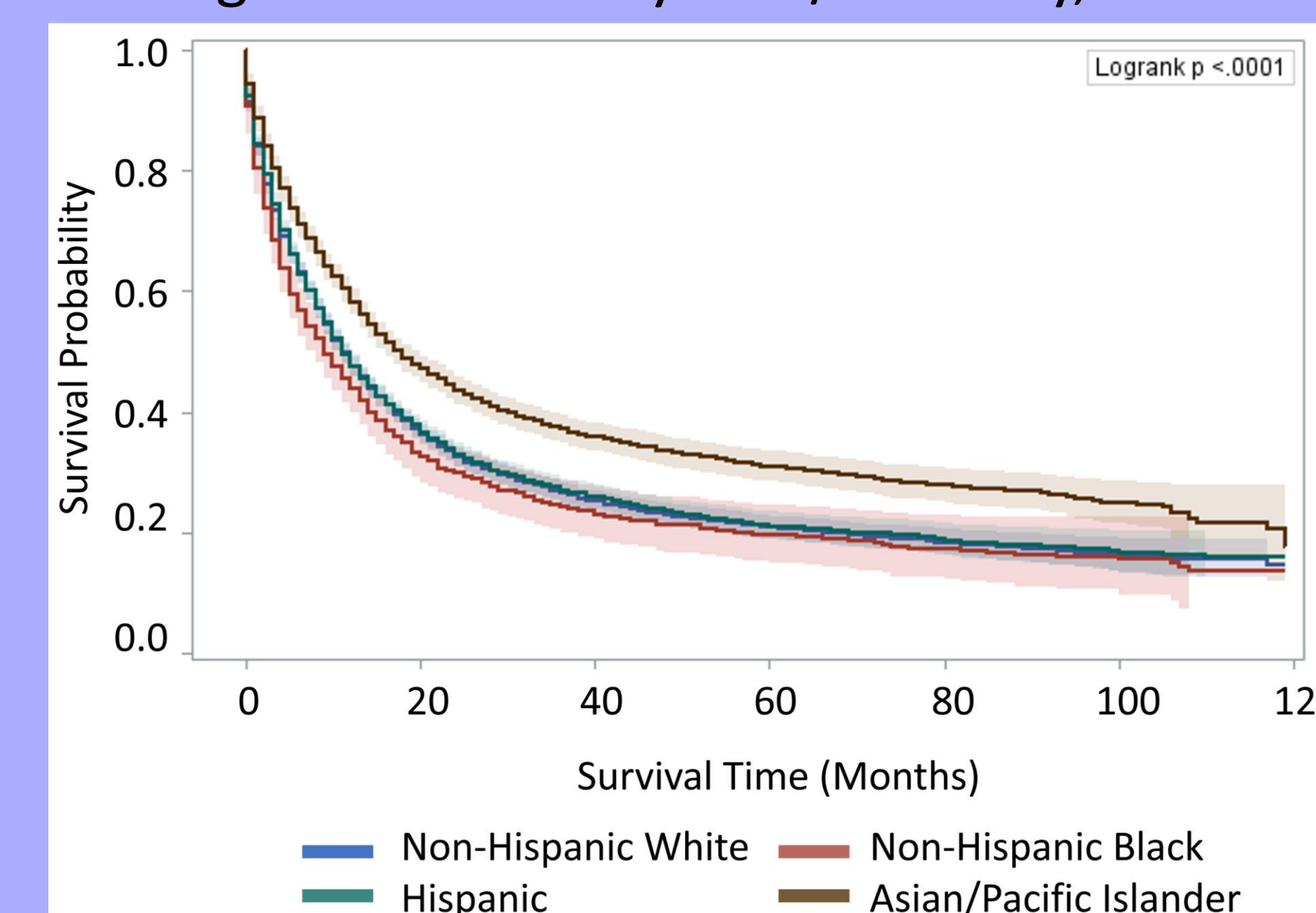


Table 1: Adjusted hazard ratios (HR) for mortality in non-Hispanic blacks, Hispanics, and Asian/Pacific Islanders versus non-Hispanic whites (reference) with epithelial gastric cancer in California, 2006-2015.

Subgroup	NHB vs. NHW HR (95% CI)	Hispanic vs. NHW HR (95% CI)	API vs. NHW HR (95% CI)
Overall	1.06 (0.98, 1.15)	0.94 (0.90, 0.99) *	0.83 (0.79, 0.88) **
Sex			
Male	1.08 (0.98, 1.19)	0.95 (0.90, 1.01)	0.80 (0.75, 0.86) **
Female	1.03 (0.91, 1.16)	0.92 (0.85, 0.99) *	0.86 (0.80, 0.94) **
Age at Diagnosis			
20-49 years	1.08 (0.85, 1.37)	0.99 (0.86, 1.14)	0.81 (0.69, 0.96) **
50-69 years	1.04 (0.92, 1.17)	0.96 (0.89, 1.03)	0.87 (0.80, 0.94) **
70+ years	1.08 (0.97, 1.21)	0.89 (0.83, 0.96) **	0.82 (0.76, 0.88) **
Neighborhood Socioeconomic Status			
Lowest	1.20 (1.03, 1.40) *	0.98 (0.87, 1.09)	0.86 (0.74, 0.99) *
Lower-Middle	0.96 (0.83, 1.12)	0.91 (0.82, 1.00) *	0.77 (0.69, 0.87) **
Middle	1.01 (0.85, 1.20)	0.86 (0.77, 0.95) **	0.80 (0.71, 0.89) **
Upper-Middle	0.94 (0.77, 1.15)	0.97 (0.87, 1.08)	0.85 (0.77, 0.94) **
Highest	1.32 (1.03, 1.70) *	1.15 (1.00, 1.34)	0.88 (0.79, 0.98) *
Marital Status			
Single/Divorced/Widowed	1.00 (0.90, 1.11)	0.89 (0.83, 0.96) **	0.79 (0.73, 0.86) **
Married/Domestic Partner	1.15 (1.02, 1.30) *	0.97 (0.91, 1.04)	0.86 (0.80, 0.92) **
Insurance			
Private	1.00 (0.88, 1.14)	0.92 (0.85, 0.99) *	0.82 (0.76, 0.89) **
Medicare	1.13 (1.01, 1.28) *	0.94 (0.87, 1.02)	0.82 (0.76, 0.89) **
Other Public	0.87 (0.53, 1.43)	0.85 (0.62, 1.16)	0.79 (0.55, 1.12)
None	0.87 (0.53, 1.43)	0.85 (0.62, 1.16)	0.79 (0.55, 1.12)
Site			
Cardia	1.13 (0.94, 1.35)	0.97 (0.88, 1.06)	0.92 (0.82, 1.03)
Noncardia	1.03 (0.93, 1.15)	0.94 (0.87, 1.00)	0.80 (0.75, 0.86) **
Overlapping/Unspecified	1.06 (0.92, 1.23)	0.91 (0.83, 1.00)	0.84 (0.76, 0.93) **
Histology			
Intestinal	1.01 (0.92, 1.11)	0.91 (0.86, 0.97) *	0.81 (0.76, 0.87) **
Diffuse	1.11 (0.95, 1.29)	1.00 (0.92, 1.10)	0.82 (0.74, 0.90) **
Other Epithelial	1.19 (0.94, 1.51)	0.94 (0.80, 1.09)	0.90 (0.75, 1.07)
Stage at Diagnosis			
Localized	1.21 (1.01, 1.46) *	0.95 (0.84, 1.08)	0.63 (0.55, 0.72) **
Regional	1.07 (0.92, 1.23)	0.95 (0.87, 1.04)	0.84 (0.77, 0.92) **
Remote	1.03 (0.93, 1.15)	0.94 (0.88, 1.00)	0.91 (0.85, 0.98) **

Each row of the table corresponds to a different survival model conducted within the respective group. NHW estimates are the reference for all comparisons. Estimates are adjusted for all other variables in the table. *Significantly different from NHWs at p <0.05; **Significantly different from NHWs at p <0.01

Conclusions

In this large population-based study of patients with epithelial gastric cancer, we sought to better understand the association of race/ethnicity and survival by comparing demographic and disease-specific mortality risk across four major racial/ethnic groups in California.

We found that APIs and Hispanics overall had significantly better prognosis than NHWs, but there was no survival difference between NHBs and NHWs. When comparing survival within homogenous subgroups, the survival advantage of APIs persisted. However, there were few groups in which NHBs and Hispanics had different survival than NHWs.

Our results suggest that APIs with gastric cancer have significantly better prognosis than other racial/ethnic groups, but that factors other than race/ethnicity may play a larger role in survival among patients with gastric cancer.

Given that survival in gastric cancer patients is poor for all races, future studies, particularly ones that investigate the role of population-specific etiological factors and molecular tumor profiles, are needed to further understand factors associated with survival.

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