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Physician visits and preventive care among Asian American and Pacific Islander long-term survivors of colorectal cancer, USA, 1996–2006

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Abstract

Purpose—Published literature on receipt of preventive healthcare services among Asian American and Pacific Islander (API) cancer survivors is scarce. We describe patterns in receipt of preventive services among API long-term colorectal cancer (CRC) survivors.

Methods—Surveillance, Epidemiology, and End Results registry–Medicare data were used to identify 9,737 API and white patients who were diagnosed with CRC during 1996–2000 and who survived 5 or more years beyond their diagnoses. We examined receipt of vaccines, mammography (females), bone densitometry (females), and cholesterol screening among the survivors and how the physician specialties they visited for follow-up care correlated to services received.

Results—APIs were less likely than whites to receive mammography (52.0 vs. 69.3 %, respectively; *P* <0.0001) but more likely to receive influenza vaccine, cholesterol screening, and bone densitometry. These findings remained significant in our multivariable model, except for receipt of bone densitometry. APIs visited PCPs only and both PCPs and oncologists more frequently than whites (*P* <0.0001). Women who visited both PCPs and oncologists compared

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with PCPs only were more likely to receive mammography (odds ratio=1.40; 95 % confidence interval, 1.05–1.86).

Conclusions—Visits to both PCPs and oncologists were associated with increased use of mammography. Although API survivors visited these specialties more frequently than white survivors, API women may need culturally appropriate outreach to increase their use of this test.

Implications for Cancer Survivors—Long-term cancer survivors need to be aware of recommended preventive healthcare services, as well as who will manage their primary care and cancer surveillance follow-up.

Keywords

Cancer survivors; Colorectal cancer; Preventive care; Physician specialty

Introduction

In 2009, colorectal cancer (CRC) was the second leading cause of cancer deaths among cancers that affect both men and women in the USA [1]. Given the advances in diagnosing CRC earlier [2], the survival rate for this disease has increased over time [3] and the number of cancer survivors is expected to increase [4]. Recent studies have highlighted gaps at the interface between primary care and specialist care during the transition to survivorship, as well as the importance of survivorship care plans that include promoting a healthy lifestyle and monitoring for cancer recurrence [5, 6]. As most cancer survivors are 50 years or older [7], the healthy behaviors that are promoted may include recommended preventive services for this age group (e.g., influenza and pneumococcal vaccination, screening for breast cancer, CRC, lipid disorders, and osteoporosis) [8].

Collectively, Asians and Pacific Islanders (APIs) have lower CRC rates than white, black, and Hispanic populations [1]; however, their exponential growth in the last 10 years [9] may affect their future cancer burden. Although APIs also have the lowest CRC death rates [1] and the highest CRC survival rates [10], CRC deaths vary when data for this population are disaggregated [11]. Disparities in CRC screening and other chronic disease risk factors and behaviors have been reported among Asian subgroups [12–14], which may contribute to differences in outcomes among those who are diagnosed with cancer. Little is known about receipt of preventive healthcare services among API cancer survivors, including whether disparities exist by subgroup. Previous studies that explored receipt of cancer and noncancer-related preventive services among cancer survivors reported that the services received varied over time and by the type of physician visited [15–18]. Studies that assessed the effect of race on these outcomes reported that whites were more likely to receive services than African Americans or “other” populations [15–17]. APIs were grouped in the latter category; therefore, data were not reported separately for them. Thus, we examine physician visits and receipt of preventive care among API and white long-term CRC survivors to describe patterns in the services they receive and how they relate to physician specialty. We also aim to identify any differences in the receipt of preventive care among API subgroups.

Methods

Surveillance, Epidemiology, and End Results (SEER) registry data files from calendar year 2008 and Medicare claims files (i.e., hospital, outpatient, hospice, and physician claims) for 1996–2006 were linked and used to identify long-term CRC survivors. Detailed methodology has been described elsewhere [19].

To be eligible for this study, CRC survivors must have been diagnosed during 1996–2000 at age 60 years or older, identified as non-Hispanic API or non-Hispanic white (hereafter referred to as API and white) on the basis of SEER race/ethnicity, living in 16 SEER areas at the times of their diagnoses, and continuously enrolled in Medicare parts A and B (with no HMO enrollment) during 2001–2006. They also must have survived for 5 years or more beyond their CRC diagnoses and had no recurrences or diagnoses of another incident cancer.

We used the SEER race variable linked to Indian Health Service administration data, as well as the North American Association of Central Cancer Registries (NAACCR) Hispanic Identification Algorithm variable, to reduce misclassification of study participants [20, 21]. To further classify API according to ancestry or ethnic background, we used the NAACCR Asian Pacific Islander Identification Algorithm variable, which uses birthplace and name to classify API patients as Chinese, Japanese, and other API descent [22].

We identified 29,484 API and white long-term CRC survivors who lived in 16 SEER areas at the times of their diagnoses, were diagnosed with CRC between 1996 and 2000, survived for at least 5 years after their diagnoses, and were diagnosed at age 60 or above. The final data set for analysis was created after excluding survivors who were not continuously enrolled in Medicare parts A and B with no HMO enrollment (n =15,839), had another incident non-CRC that occurred after a CRC diagnosis in the 1996–2000 time period (n =1,079), and had a nonmalignant CRC diagnosis based on behavior recode (n =2,384). These exclusions were not mutually exclusive, and left 12,042 CRC survivors in the analysis. To limit the analysis to CRC survivors without a terminal illness or recurrence, we also excluded (1) survivors with hospice claims during the 2001– 2006 time period (n =225); (2) survivors who had at least one chemotherapy claim based on hospital, outpatient, or physician claims, with the last claim date occurring 12 months after the therapy start date based on SEER data (n =1,305); or (3) survivors with at least one radiation claim from either hospital, outpatient, or physician claims with the last claim date occurring 12 months after the SEER therapy start date (n =415). These exclusions were not mutually exclusive because some survivors had claims for hospice, chemotherapy, and radiation. In addition, one survivor was excluded because of a mismatch between the SEER age group category and the Medicare date of birth variable. An additional 261 survivors were excluded for having American Joint Committee on Cancer (AJCC) unknown stage, which left 9,737 survivors in the analysis.

Preventive medical services and type of physician administering care were analyzed from the beginning of the 5-year anniversary date of diagnosis through the end of the follow-up period, 31 December 2006. We used ICD-9 or CPT codes to assess the following preventive medical services received anytime during the follow-up period: influenza vaccine or pneumococcal vaccine; cholesterol screening; mammography for women aged younger than 75 years at their 5-year anniversary date of diagnosis; and bone density screening among women. The types of physicians visited were identified by the specialty listed on physician claims for Evaluation and Management visits (CPT codes: 99201–99205 and 99211–99215). Primary care physicians (PCPs) included those practicing family medicine, general practice, and internal medicine, and providers classified as multispecialty clinic or group. Oncologists included hematologists/oncologists, medical oncologists, surgical oncologists, radiation oncologists, and general surgeons. Cancer-related specialists included colorectal surgeons and gastroenterologists. “Other” specialists included physicians not categorized as PCPs, oncologists, or cancer-related specialists.

To control for comorbidity and its effect on the physicians visited and preventive medical services received, we calculated the Charlson comorbidity index [23]. Comorbidity was derived from claims occurring after the 5th anniversary date of diagnosis through the 1st day of the 6th anniversary date of diagnosis.

We calculated descriptive statistics for the following demographic and clinical characteristics of API (Chinese, Japanese, and other API) and white CRC survivors: mean age at the time of CRC diagnosis, sex, AJCC stage (I, II, and III/IV), comorbidity index (mean value and categories—0, 1, and ≥2), SEER Registry Site (Hawaii, Seattle-Puget Sound, Los Angeles, San Francisco-Oakland, San Jose-Monterey, Greater California, and other SEER registries, grouping Detroit, Iowa, New Mexico, Utah, Atlanta, Rural Georgia, Kentucky, Louisiana, and New Jersey together), number of previous cancer diagnoses (0, 1, or more than 1), year of diagnosis, and the resident census tract poverty level based on the percentage of census tract residents living below the federal poverty level in 2000, which is expressed as quartiles based on the distribution among the total study population (0–3.90, 3.91–6.76, 6.77–11.67, and ≥11.68 %). As a number of survivors from API ethnic groups other than Chinese and Japanese were small, their data were combined and categorized as “other API.” Similarly, the numbers of API survivors with stages III and IV CRC were small; therefore, we collapsed these stages into a single stage category (stage III/IV).

To compare patterns of physician specialties visited during the follow-up period, we calculated the proportion of API and white CRC survivors who had one or more visits with the following physicians: PCPs with no visit to an oncologist; visits to both PCPs and oncologists; visits to an oncologist but not to a PCP; visits to a cancer-related specialist; and no visits to a PCP, an oncologist, or a cancer-related specialist, including visits to other physician specialists only or no physician visits. We calculated the mean number of physician visits in each of these categories and visits to any physician during the follow-up period, all of which were adjusted by the number of follow-up years to represent average annual physician visits.

We assessed differences between API and white CRC survivors using chi square tests for categorical variables and one-way analysis of variance for age at diagnosis. As the comorbidity index and the number of medical visits by provider types were not normally distributed, we used the Kruskal–Wallis test. All values were considered statistically significant if $P < 0.05$.

We calculated individual follow-up time in years to control for its effect in multivariable analyses. We controlled for the total number of physician visits during the follow-up period. After controlling for demographic factors and selected clinical characteristics, we conducted multivariable logistic regression to determine whether API and white CRC survivors differed on receipt of preventive medical services and whether physician type influenced receipt of these services. We built separate models for receipt of influenza vaccine, pneumococcal vaccine, cholesterol screening, mammography among women aged 65–74 years, and bone density screening among women. As mammography and bone density testing were limited to female survivors, we also conducted a separate analysis to assess differences in survivor characteristics by gender. Receipt of each preventive service (at least one service provided during the follow-up period) was the dependent variable, whereas independent variables included providers visited, API or white race, age at diagnosis, sex (in models that included both males and females), stage at diagnosis, comorbidities, number of primary cancers, SEER registry site, number of follow-up years, total number of physician visits during the follow-up period, and poverty level. The referent group in this model was "PCP only." Because sample sizes were small for the oncologist only category and other physician specialties, we did not disaggregate APIs by ethnic background in the final multivariable models. All analyses were conducted using SAS version 9.3 (SAS Institute, Cary, NC).

Results

Study group characteristics

The mean age at diagnosis of the 9,737 long-term CRC survivors ranged from 71.8 years (other API) to 74.3 years (both Chinese and white patients; Table 1). Nearly two thirds of API survivors resided in Hawaii and Los Angeles. Compared with white survivors, significantly lower percentages of API survivors were diagnosed at stage I, had no comorbidities, and resided in census tracts where 3.9 % or less of the population lived below the federal poverty level. Statistically significant differences in the survivors' characteristics did not change when we restricted the demographic analysis to women.

Vaccinations

From the beginning of survivors' 5-year anniversary date of diagnosis through the end of the study follow-up period, receipt of influenza vaccine was higher ($P<0.0001$) among API survivors (81.4 %) compared with white survivors (73.1 %; Table 2). Survivors who visited both PCPs and oncologists were more likely to receive influenza vaccine ($P<0.0001$) and pneumococcal vaccine ($P<0.0001$) compared with those who visited other physician specialists (Table 3), but these associations did not remain significant after adjusting for demographic and clinical characteristics. Factors that increased the odds of receiving the two vaccines included visiting a PCP only, living in a certain SEER registry site, and visiting a physician six or more times (Table 4). API race and older age at diagnosis were other predictors of receipt of influenza vaccine.

Cholesterol screening

Receipt of cholesterol screening was higher (*P* <0.0001) among API survivors (83.5 %) compared with white survivors (74.3 %; Table 2). Among Asian subgroups, Japanese American survivors were more likely to receive this test than other groups. Receipt of lipid testing was also significantly higher among survivors who visited both PCPs and oncologists compared with those who saw other physician specialties (Table 3). In our multivariable model, however, visits to PCPs only increased the odds of receiving this test. Other predictors included API race, earlier stage and younger age at diagnosis, and residing in census tracts with lower poverty levels (Table 4).

Mammography

Receipt of mammography was significantly higher among white survivors (69.3 %) compared with API survivors (52 %; Table 2). Survivors who visited both PCPs and oncologists were more likely than those who visited other physician specialties to receive mammography (P <0.0001; Table 3); however, the percentages were similar for those who visited both PCPs and oncologists and those who saw oncologists only. After adjustment for confounders, white race and visits to both a PCP and oncologist were still significant. Other predictors included living in Seattle-Puget Sound and visiting physicians more frequently.

Bone densitometry

API survivors were significantly more likely to receive bone density testing (37.8 %) compared with white survivors (29.8 %; Table 2). Receipt of bone densitometry was higher among survivors who were seen by both PCPs and oncologists (Table 3). These findings were no longer significant in our multivariable model. Predictors of receipt of this test included younger age and earlier stage at diagnosis, having no comorbidities, and living in an “other” SEER registry site (Table 4).

Physician mix and mean number of physician visits

The percentages of API survivors and white survivors who visited PCPs only were similar (55.1 and 53.6 %, respectively), as were the percentages of API and white survivors who saw both PCPs and oncologists (30.7 and 29.6 %, respectively; Table 5). API survivors visited PCPs only (P <0.0001) and both PCPs and oncologists (P <0.0001) more frequently than white survivors.

Discussion

Overall, higher percentages of API survivors received preventive services compared with white survivors, except for mammography. However, race did not remain a significant predictor of receipt of pneumococcal vaccine or bone density testing in our multivariable model. We found that survivors were more likely to visit PCPs only than cancer specialists, which is consistent with previous studies [15, 24]. Compared with survivors who visited oncologists only, those who visited PCPs only had significantly increased odds of receiving vaccines and cholesterol screening. Snyder and colleagues also reported that receipt of lipid testing was increased among survivors who visited PCPs only. However they, as well as Earle and colleagues, found that visits to both PCPs and oncologists were associated with receipt of influenza vaccine and mammography [15, 17]. In our study, mammography was the only service which survivors who visited both PCPs and oncologists had significantly increased odds of receiving. Some of the differences between our adjusted findings and those reported in previous research may be attributable to our use of PCPs as a referent group.

The total number of physician visits also predicted receipt of preventive care in our study, although a dose–response relationship was less evident for mammography. Some studies have reported an association between frequency of physician visits and receipt of preventive services among long-term cancer survivors, but others have not [15, 16, 25, 26]. Our findings regarding the number of visits and receipt of mammography could be related to the fact that, in later follow-up years, some women were no longer age-eligible for this screening test. Other studies have reported that mammography rates among long-term CRC survivors decrease over time [15, 27, 28]. Physicians' perspectives about breast cancer screening in older women vary and might influence their mammography practices [29, 30]. The increased odds of receiving mammograms observed among long-term survivors who visited both PCPs and oncologists compared with those who visited PCPs only might reflect differences in providers' perspectives about their responsibilities in providing survivorship care. Cheung and colleagues reported significant disagreement between PCPs and oncologists regarding their roles in the medical management of cancer survivors [31].

Our findings confirm that PCPs perform a central role to ensure that long-term CRC survivors use preventive health services. However, survivors are more likely to receive mammography when their care is shared by PCPs and cancer specialists. Coordinating survivorship care among multiple providers can be a challenge. In 2006, the Institute of Medicine (IOM) reported that a fragmented health care system is one of several barriers that hamper health care providers' delivery of comprehensive cancer survivorship care [32]. The IOM indicated that improved coordination of care among PCPs, cancer specialists, and other health care providers is crucial to building an integrated system of care, and recommended that survivors receive care plans to help manage potential long-term effects of their cancer and its treatment. The establishment of survivorship programs and the use of treatment summaries and care plans have increased since the IOM's recommendations on cancer survivorship care were published [33–35]. Some organizations have also developed cancer survivorship guidelines [36–38]. However, lack of high-quality evidence remains a barrier to the development of standardized practice recommendations for post-treatment care [37]. Other barriers to coordinating follow-up care include limited survivorship care training for healthcare providers, and lack of reimbursement for cancer care planning [37].

Even though all survivors in this study had health insurance, and similar percentages of API and white survivors visited PCPs only and both PCPs and oncologists, receipt of preventive health services varied by race and Asian subgroup. These differences could be related to the total number of physician visits, which was associated with receipt of care and varied by race. Lack of full coverage by Medicare for some preventive health services throughout the entire study period (e.g., mammography) also could have been a barrier to use of these services. Carrasquillo et al. reported that beneficiaries without supplemental insurance were less likely to receive partially covered services than those who had additional coverage or were enrolled in HMOs [39].

Studies examining use of preventive care services among the API population, particularly API cancer survivors, are scarce in the published literature. Some studies have reported that, in the USA, fewer elderly Asians had ever received pneumococcal vaccine compared with whites [40, 41]. The pneumococcal vaccination rate among API CRC survivors in our study was slightly higher than the rate for white survivors but lower than the rate reported in the 2009 Racial and Ethnic Approaches to Community Health across the USA (REACH U.S.) Risk Factor Survey for older Asian Americans (59.7 %) [42].The rate that we observed may have been lower because we did not assess receipt of the vaccine before survivors were diagnosed with CRC. The rate of receipt of influenza vaccine among API survivors (81.4 %) was similar to that reported in the REACH U.S. survey for older APIs (79.5 %) but higher than the rate reported in a survey of elderly Asian Americans in California (71 %) [42, 43]. We could not find data in the published literature with which to compare our findings regarding lipid screening among older APIs. Breast cancer screening rates were lower for survivors within all API subgroups compared with white survivors. Previous studies of mammography rates among women aged 65 years or older have reported a disparity between API and white females [43, 44]. Many API women report the same barriers to breast cancer screening as other women, but those who hold more Eastern cultural views or believe that screening is unnecessary if they feel okay are less likely to receive mammography [45, 46]. Additional studies are needed to further describe the use of healthcare services among APIs, particularly among API cancer survivors. Examining barriers to health care, including access to a medical home, health literacy, English language proficiency, acculturation, and immigration status, would help illuminate and define health disparities experienced by this population. Efforts are also needed to refine data collection for API and other racial and ethnic populations to allow for subgroup analyses.

Our study has limitations. First, even though we used a population-based database that included Asian ethnicity data, the total number of API cases was small. This limited our ability to conduct subgroup analyses. Second, most API cases came from Hawaii and selected areas in California. We controlled for SEER registry areas in our multivariable logistic regression analyses. However, there may have been residual confounding with geographic areas and provider practices in these SEER locations. Third, we were not able to include Medicare beneficiaries enrolled in managed care plans because they do not submit claims to Medicare. By 2001, Medicare HMO penetration in California was 40 % [47]. Fourth, grouping physician specialties into four physician categories may have masked differences within the categories for the type of care they provide. Studies have reported that the quality of physician specialty data in Medicare claims varies [48] and that claims are less likely to identify cancer specialists than other sources [49]. We used medical specialty information provided in claims data only; therefore, the information was not verified against provider databases. Lastly, we used Census tract-level SES as a proxy for individual-level SES, which may not adequately represent individual status. We also chose not to include place of birth in our model. This information was missing for many API (33 %) and white survivors (62 %), and it was a confounder for Asian ethnicity.

Conclusions

Our study findings underscore the need for improved collaboration between PCPs and oncology specialists to clarify roles and responsibilities in cancer survivors' long-term follow-up care. Cancer prevention and control entities are developing and implementing strategies that may improve communication between primary care providers and oncologists, including expansion of cancer survivorship training for healthcare practitioners, development of guidelines for long-term follow-up care, and support for research related to the development and evaluation of evidence-based survivorship care models [50, 51]. These efforts need to continue.

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Table 1

Characteristics of Asian/Pacific Islander and white colorectal cancer survivors (*N* =9,737), USA, 1996–2000

Characteristic	White (*n* =9,065)		All API (*n* =672)		*P* value[a]	Chinese (*n* =186)		Japanese (*n* =267)		Other API (*n* =219)		*P* value[a]
	No.(%)		No.(%)			No.(%)		No.(%)		No.(%)		
Age at CRC diagnosis (years)												
Mean	74.3		72.9		<0.0001	74.3		72.9		71.8		0.0009
SD	6.7		6.5			7.0		6.1		6.5		
Sex												
Female	5,231	57.7	339	50.5	0.0002	97	52.2	142	53.2	100	45.7	0.2207
Male	3,834	42.3	333	49.6		89	47.9	125	46.8	119	54.3	
Stage												
I	3,967	43.8	280	41.7	0.017	0 71	38.2	124	46.4	85	38.8	0.0692
II	3,337	36.8	231	34.4		61	32.8	82	30.7	88	40.2	
III/IV	1,761	19.4	161	24.0		54	29.0	61	22.9	46	21.0	
Comorbidity index[b]												
Mean	0.5		0.6		0.0007	0.6		0.5		0.7		0.2036
SD	0.8		0.9			1.0		0.8		1.0		
0	5,928	65.4	393	58.5	0.0009	116	62.4	158	59.2	119	54.3	0.0494
1	2,036	22.5	169	25.2		40	21.5	76	28.5	53	24.2	
≥2	886	9.8	85	12.7		26	14.0	22	8.2	37	16.9	
SEER registry site												
Hawaii	49	0.5	217	32.3	<0.0001	_d	_d	_d	_d	_d	_d	<0.0001
Seattle-Puget Sound	907	10.0	37	5.5		_d	_d	_d	_d	_d	_d	
Los Angeles	792	8.7	205	30.5		_d	_d	_d	_d	_d	_d	
San Francisco-Oakland	421	4.6	96	14.3		_d	_d	_d	_d	_d	_d	
San Jose-Monterey	326	3.6	58	8.6		_d	_d	_d	_d	_d	_d	
Greater California	524	5.8	32	4.8		_d	_d	_d	_d	_d	_d	
Other SEER registry site[c]	6,046	66.7	27	4.0		_d	_d	_d	_d	_d	_d	
Number of Prior Cancer Diagnoses (primary sites)												
0	7,733	85.3	609	90.6	0.0001	164	88.2	241	90.3	204	93.2	0.2228

Characteristic	White (n =9,065)		All API (n =672)		*P* value[a]	Chinese (n =186)		Japanese (n =267)		Other API (n =219)		*P* value[a]
	No.(%)		No.(%)			No.(%)		No.(%)		No.(%)		
1 or more	1,332	14.7	63	9.4		22	11.8	26	9.7	15	6.9	
Year of Diagnosis												
1996	1,273	14.0	110	16.4	<0.0001	35	18.8	42	15.7	33	15.1	0.2912
1997	1,383	15.3	125	18.6		36	19.4	53	19.9	36	16.4	
1998	1,561	17.2	123	18.3		30	16.1	42	15.7	51	23.3	
1999	1,553	17.1	140	20.8		40	21.5	63	23.6	37	16.9	
2000	3,295	36.4	174	25.9		45	24.2	67	25.1	62	28.3	
Poverty level (% tract residents below federal poverty level)[b]												
0–3.90 %	2,093	23.1	105	15.6	<0.0001	34	18.3	37	13.9	34	15.5	0.4066
3.91–6.76 %	2,063	22.8	135	20.1		38	20.4	61	22.9	36	16.4	
6.77–11.67 %	2,059	22.7	135	20.1		32	17.2	60	22.5	43	19.6	
≥11.68 %	1,936	21.4	267	39.7		72	38.7	97	36.3	98	44.8	

API Asian/Pacific Islander

[a] *P* values compare all API survivors to white CRC survivors and API subgroup survivors to one another, respectively

[b] Percentages for comorbidity and poverty level do not total 100 % due to suppression of the unknown category

[c] Other SEER registries include Detroit, Iowa, New Mexico, Utah, Atlanta, Rural Georgia, Kentucky, Louisiana, and New Jersey

[d] Considering that at least one cell count was less than 11, all data for API subgroups have been suppressed

Table 2

Selected preventive care services received during the fifth to tenth years since survivors' diagnoses by race, USA (*n* =9,737), 2001–2006

Primary Care Service	**Race**											
	White		**All API**		***P* value**[a]	**Chinese**		**Japanese**		**Other API**		***P* value**[a]
	No.	**%**	**No.**	**%**		**No.**	**%**	**No.**	**%**	**No.**	**%**	
Influenza vaccination (any)	6,629	73.1	547	81.4	<0.0001	158	85.0	220	82.4	169	77.2	0.1159
Pneumococcal vaccination	1,713	18.9	141	21.0	0.1840	42	22.6	53	19.9	46	21.0	0.7815
Cholesterol screening	6,739	74.3	561	83.5	<0.0001	159	85.5	231	86.5	171	78.1	0.0309
Mammograms (any)[b, c]	925	69.3	66	52.0	<0.0001	14	46.7	30	56.6	22	50.0	0.6497
Bone densitometry[b]	1,557	29.8	128	37.8	0.0019	31	32.0	64	45.1	33	33.0	0.0614

API Asian/Pacific Islander

[a] *P* values compare all API survivors to white CRC survivors, and API subgroup survivors to one another, respectively

[b] Percentages and P values based on the number of females only

[c] Percentages and P values based on women under the age of 75 years at their 5-year anniversary date of diagnosis

Table 3

Selected preventive care services received during the fifth to tenth years since survivors' diagnoses by physician specialty, USA (n =9,737), 2001–2006

Primary Care Service	Physician specialty										
	Primary care physician only (PCP)		Oncologist only		Both PCP and oncologist		Cancer-related specialist only		Neither PCP nor oncologist		*P* value
	No.	%	No.	%	No.	%	No.	%	No.	%	
Influenza vaccination (any)	3,993	76.4	258	58.5	2,333	80.7	100	61.4	492	48.4	<0.0001
Pneumococcal vaccination	1,070	20.5	47	10.7	623	21.6	21	12.9	93	9.2	<0.0001
Cholesterol screening	4,109	78.6	276	62.6	2,397	82.9	101	62.0	417	41.0	<0.0001
Bone densitometry[a]	951	30.8	50	22.9	614	37.5	23	27.4	47	8.7	<0.0001
Mammograms (any)[a,b]	483	67.1	52	74.3	406	75.5	16	57.1	34	32.4	<0.0001

API Asian/Pacific Islander

[a]Percentages and P values based on the number of females only

[b]Percentages and P values based on women under the age of 75 years at their five-year anniversary date of diagnosis

Table 4

Adjusted odds ratios for Asian/Pacific Islander and white long-term colorectal cancer survivors receiving preventive care services, 2001–2006

	Influenza vaccination		Pneumococcal vaccination		Cholesterol screening		Mammography[a, b]		Bone densitometry[a]	
	OR	**CI**	**OR**	**CI**	**OR**	**CI**	**OR**	**CI**	**OR**	**CI**
Race/ethnicity										
Non-Hispanic white	Ref		Ref		Ref		Ref		Ref	
API	1.81	(1.40, 2.35)	1.18	(0.93, 1.49)	1.45	(1.09, 1.93)	0.45	(0.27, 0.76)	1.03	(0.77, 1.39)
Physician category										
PCP only	Ref		Ref		Ref		Ref		Ref	
PCP and oncologist	1.01	(0.89, 1.14)	0.89	(079, 1.01)	0.95	(0.83, 1.08)	1.40	(1.05, 1.86)	1.01	(0.88, 1.16)
Oncologist only	0.56	(0.46, 0.70)	0.58	(0.42, 0.79)	0.60	(0.48, 0.75)	1.83	(1.00, 3.35)	0.83	(0.58, 1.17)
Cancer-related specialist	0.61	(0.43, 0.86)	0.68	(0.42, 1.09)	0.50	(0.35, 0.71)	0.83	(0.37, 1.88)	1.00	(0.59, 1.68)
Other physician/none	0.65	(0.55, 0.76)	0.81	(0.63, 1.05)	0.50	(0.43, 0.60)	0.57	(0.33, 0.96)	0.58	(0.41, 0.81)
Age at diagnosis										
60–64	Ref		Ref		Ref		Ref		Ref	
65–74	1.19	(0.99, 1.43)	0.94	(0.78, 1.14)	0.95	(0.76, 1.19)	0.71	(0.52, 0.95)	0.68	(0.54, 0.87)
75+	1.50	(1.24, 1.81)	0.97	(0.80, 1.17)	0.44	(0.35, 0.55)	N/A		0.33	(0.26, 0.42)
Sex										
Female	0.96	(0.87, 1.06)	0.97	(0.87, 1.08)	1.06	(0.95, 1.18)				
Male	Ref		Ref		Ref		N/A		N/A	
Stage at diagnosis										
I	Ref		Ref		Ref		Ref		Ref	
II	0.89	(0.80, 0.99)	1.10	(0.98, 1.24)	0.79	(0.71, 0.89)	0.66	(0.50, 0.87)	0.78	(0.68, 0.90)
III/IV	0.92	(0.80, 1.05)	1.09	(0.94, 1.26)	0.76	(0.66, 0.88)	1.02	(0.73, 1.43)	0.82	(0.69, 0.98)
Comorbidities										
0	Ref		Ref		Ref		Ref		Ref	
1	1.11	(0.98, 1.26)	1.11	(0.98, 1.27)	1.58	(1.38, 1.81)	0.79	(0.58, 1.08)	0.60	(0.51, 0.71)
≥2	1.19	(1.00, 1.42)	1.18	(0.99, 1.41)	1.69	(1.39, 2.06)	0.53	(0.35, 0.82)	0.48	(0.38, 0.61)
Unknown	0.14	(0.10, 0.20)	0.59	(0.35, 0.98)	0.17	(0.12, 0.24)	0.05	(0.01, 0.23)	0.17	(0.06, 0.49)
Number of primary cancers										
Only 1	Ref		Ref		Ref		Ref		Ref	

	Influenza vaccination		Pneumococcal vaccination		Cholesterol screening		Mammography[a, b]		Bone densitometry[a]	
	OR	**CI**	**OR**	**CI**	**OR**	**CI**	**OR**	**CI**	**OR**	**CI**
2 or more	1.19	(0.98, 1.43)	1.07	(0.87, 1.31)	0.73	(0.61, 0.89)	0.80 (0.85,	(0.48, 1.34)	1.09	1.40)
SEER Registry										
Other SEER registry	Ref		Ref		Ref		Ref		Ref	
Greater California	0.75	(0.61, 0.91)	1.07	(0.80, 1.41)	1.15	(0.92, 1.43)	1.14	(0.62, 2.09)	0.99	(0.71, 1.37)
Hawaii	0.79	(0.53, 1.16)	0.42	(0.27, 0.65)	0.88	(0.58, 1.33)	1.66	(0.70, 3.92)	1.46	(0.91, 2.33)
Los Angeles	0.59	(0.50, 0.71)	1.03	(0.86, 1.23)	1.64	(1.32, 2.02)	0.79	(0.52, 1.20)	1.23	(0.99, 1.52)
San Francisco-Oakland	0.67	(0.54, 0.84)	1.10	(0.88, 1.38)	0.97	(0.76, 1.24)	0.71	(0.41, 1.23)	0.71	(0.53, 0.94)
San Jose-Monterey	1.05	(0.79, 1.38)	1.41	(1.10, 1.80)	0.97	(0.74, 1.29)	0.74	(0.40, 1.38)	1.24	(0.91, 1.70)
Seattle-Puget Sound	1.07	(0.90, 1.27)	1.12	(0.93, 1.33)	1.01	(0.85, 1.21)	1.62	(1.01, 2.58)	1.02	(0.82, 1.27)
Number of follow-up years										
Each year increase	1.09	(1.05, 1.14)	1.27	(1.22, 1.33)	1.05	(1.00, 1.10)	1.23	(1.11, 1.37)	1.15	(1.09, 1.21)
Poverty level (2000 Census)										
0–3.90 %	Ref		Ref		Ref		Ref		Ref	
3.91–6.76 %	0.99	(0.86, 1.15)	1.00	(0.86, 1.17)	0.74	(0.63, 0.87)	0.96	(0.67, 1.38)	0.91	(0.76, 1.10)
6.77–11.67 %	0.95	(0.82, 1.09)	0.96	(0.82, 1.12)	0.66	(0.56, 0.78)	1.21	(0.85, 1.74)	0.82	(0.68, 0.99)
≥11.68 %	0.95	(0.82, 1.10)	0.93	(0.79, 1.10)	0.58	(0.49, 0.68)	0.90	(0.63, 1.29)	0.93	(0.77, 1.12)
Unknown	0.94	(0.74, 1.19)	0.95	(0.74, 1.22)	0.83	(0.65, 1.07)	0.66	(0.36, 1.22)	0.99	(0.73, 1.34)
Total number of physician visits										
0–5	Ref		Ref		Ref		Ref		Ref	
6–11	1.58	(1.36, 1.82)	1.67	(1.33, 2.10)	2.56	(2.20, 2.98)	1.82	(1.21, 2.74)	2.12	(1.64, 2.74)
12–19	2.34	(2.00, 2.74)	2.15	(1.71, 2.70)	3.64	(3.09, 4.30)	2.58	(1.68, 3.96)	2.75	(2.13, 3.57)
20–33	2.94	(2.47, 3.50)	2.56	(2.03, 3.22)	4.64	(3.86, 5.59)	2.57	(1.64, 4.04)	3.81	(2.92, 4.97)
≥34	5.07	(4.10, 6.26)	3.02	(2.37, 3.84)	7.03	(5.64, 8.77)	2.20	(1.32, 3.65)	5.46	(4.12, 7.24)

API Asian/Pacific Islander, *N/A* indicates not applicable, *PCP* primary care physician, *Ref* referent group

[a] These models were limited to women only

[b] Mammography test use was limited to women aged 65–74 years at their 5-year anniversary date of diagnosis (n =1,461)

Table 5

Percentages of Asian/Pacific Islander and white long-term colorectal cancer survivors who visited physicians during the fifth to tenth years since their diagnosis and mean number of physician visits per year, 2001–2006

Physician mix	All API		White		*P* value[a]	All API		White		*P* value[a]
	No.	%	No.	%		Mean No. visits[b]	SD	Mean No. visits[b]	SD	
Any physician	642	95.5	8,617	95.1	0.5802	9.2	6.2	7.2	5.7	<0.0001
PCP only	370	55.1	4,857	53.6	0.2590	5.8	4.5	3.9	3.2	<0.0001
Both PCP and oncologist	206	30.7	2,684	29.6		7.3	4.6	5.6	4.0	<0.0001
No PCP[d]	96	14.3	1,524	16.8		5.6	4.6	4.6	4.9	0.0245
Oncologist only[e]	22	3.3	419	4.6		2.9	2.6	2.0	2.5	0.0553
Cancer-related specialist only	14	2.1	149	1.6		1.5	3.1	1.4	1.5	0.0736
Other physician/none	60	8.9	956	10.6		4.2	3.7	3.7	4.0	0.2661

API Asian/Pacific Islander, *PCP* primary care physician, *SD* standard deviation

[a] *P* values from Chi-square tests comparing API survivors to white survivors on visits to any physicians and to specific types of physicians which are mutually exclusive for the following categories: PCP, both PCP and oncologist, oncologist only, cancer-related specialist only, and other physician/none

[b] Calculation of mean number of visits was limited to cancer survivors with at least one physician visit over the follow-up period

[c] *P* values from Kruskal–Wallis test comparing API survivors to white survivors on number of physician visits

[d] The "no PCP" category includes visits to other physician specialists, including oncologists and CRC-related specialists

[e] The "oncologist" category includes hematologists/oncologists, medical oncologists, surgical oncologists, radiation oncologists, and general surgeons