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Cervical Cancer Incidence Among 6 Asian Ethnic Groups in the United States, 1996 Through 2004

Sophia S. Wang, PhD^{1,2}, J. Daniel Carreon, MS², Scarlett L. Gomez, PhD^{3,4}, and Susan S. Devesa, PhD²

¹Division of Etiology, Department of Population Sciences, City of Hope, Duarte, California

²Division of Cancer Epidemiology and Genetics, National Cancer Institute, National Institutes of Health, Department of Health and Human Services, Rockville, Maryland ³Northern California Cancer Center, Fremont, California ⁴Health Policy and Research Department, Stanford University, Stanford, California

Abstract

BACKGROUND—Cervical cancer incidence was evaluated by histologic type, age at diagnosis, and disease stage for 6 Asian ethnic groups residing in the United States.

METHODS—Incidence rates were estimated for cervical squamous cell carcinoma (SCC) and adenocarcinoma by age and stage for 6 Asian ethnic groups—Asian Indian/Pakistani, Chinese, Filipino, Japanese, Korean, and Vietnamese—in 5 US cancer registry areas during 1996 through 2004. For comparison, rates among non-Hispanic whites, non-Hispanic blacks, and Hispanics were also calculated.

RESULTS—During 1996 through 2004, Vietnamese women had the highest (18.9 per 100,000) and Asian Indian/Pakistani women had the lowest (4.5) incidence of cervical cancer; this pattern was consistent by histologic type. Vietnamese women also had the highest incidence for localized (7.3) and regional (5.7) SCC and for localized (2.4) adenocarcinoma. Contrary to the plateau of SCC incidence apparent among white women by age 45 years, SCC rates continued to rise with age among Chinese, Filipina, Korean, and Vietnamese women.

CONCLUSIONS—There exists large variation in invasive cervical cancer incidence patterns among Asian ethnic groups in the United States and in comparison with rates for blacks, Hispanics, and whites. Early detection and prevention strategies for cervical cancer among Asians require targeted strategies by ethnic group.

Keywords

cervical cancer; race; ethnicity; Asian; incidence; rate

Distinct differences in cervical cancer incidence rates in the United States have been shown between blacks, Hispanics, and whites^{1,2} and more recently for Asians.³ However, the

composite population designated as Asian is a heterogeneous group. In the US National Cancer Institute's Surveillance, Epidemiology, and End Results (SEER) program, the Asian or Pacific Islander category comprises at least 12 different ethnic categories, each of which have distinct patterns of cancer incidence.⁴⁻⁶ Evaluating this group in aggregate therefore masks variations in rates that may be related to known and unknown cultural, behavioral, and socioeconomic differences.

Bates et al⁷ recently reported overall incidence of cervical cancer by Asian ethnic groups based on data from the California Cancer Registry, a part of the SEER program, and found distinct differences across Asian ethnic groups. Here, we extend that line of inquiry to 5 registries with substantial Asian populations that are part of the SEER program and further investigate the patterns by histologic type, age, and stage. We used the best available yearly population estimates for Asian ethnic groups residing in the United States and combined them with SEER case data to evaluate cervical cancer incidence rates among 6 Asian ethnic groups during 1996 through 2004. One of the most common cancers among some Asian ethnic groups,⁴ our primary goal was to delineate and better characterize the differences in cervical cancer incidence among Asian ethnic groups. Identifying potential explanations for these differences will help inform prevention and early detection efforts toward reducing the overall burden of cervical cancer in these populations.

MATERIALS AND METHODS

Case Ascertainment

Case data were obtained from SEER, for which data collection began in the 1970s with population-based registries in 5 states and 4 metropolitan areas, followed by later expansion to include additional registries. We evaluated rates for 12 SEER areas combined and then restricted our analysis to the 5 SEER registries with the largest Asian populations: Hawaii, Los Angeles, Seattle-Puget Sound, San Francisco-Oakland, and San Jose-Monterey. Case information was obtained from the November 2006 SEER data submission released in April 2007.⁸

SEER registries report patient demographic data including age, race, ethnicity, sex, date of tumor diagnosis, and information on the tumor histological type, primary site, and stage at diagnosis. Although SEER and the US Census Bureau use the term "race," we substitute "ethnic group" where possible. For this analysis, we used population categories of Asian/Pacific Islander (non-Hispanic), black (non-Hispanic), Hispanic, white (non-Hispanic), and the 6 largest Asian ethnic groups in the United States—Asian Indian/Pakistani, Chinese, Filipino, Japanese, Korean, and Vietnamese. We combined Asian Indian and Pakistani case and population data to be consistent with SEER program practices and to provide more robust incidence estimates. We did not estimate incidence for patients coded in SEER registries as "Asian, not otherwise specified" for lack of corresponding population estimates. The overall Asian/Pacific Islander category available in SEER and presented here includes Pacific Islanders and many more Asian ethnic groups than the 6 Asian ethnic groups examined in this article.

We included primary invasive cases, defined using the International Classification of Diseases for Oncology 3rd edition⁹ codes 8050–8130 for squamous cell carcinoma (SCC), 8140–8490 for adenocarcinoma, 8500–9582 for other (specified), and 8000–8046 for not specified or poorly specified histologic types. Although the latter 2 categories are a heterogeneous group, we report their estimates in our results to provide a complete picture that enables proper interpretation of the SCC and adenocarcinoma estimates.

Population Estimates

For our customized SEER database, population estimates by county from the US Census Bureau were obtained to match with case data from 2 SEER registries, Los Angeles and Seattle-Puget Sound. For these areas, we used data generated by the US Census Bureau American Fact Finder for 2000.¹⁰ Census 2000 respondents were allowed to self-identify with 1 or more races. We therefore estimated a population denominator that was the average of the single and multiple race counts. We multiplied this new 2000 average population estimate, the midpoint of the 9-year period (1996–2004), by 9 to derive the woman-years at risk. For Hawaii, the Hawaii Tumor Registry supplied detailed population estimates, and we used their 2000 population estimates multiplied by 9 to cover our 9-year analytical period. Population estimates for Asian Indians/Pakistanis and Vietnamese were not available for Hawaii. For the San Francisco-Oakland and San Jose-Monterey SEER registry areas, population estimates, for which methods of ascertainment have been described previously,¹¹ were supplied by the Northern California Cancer Center. Population files and SEER case files were merged using SEER*Prep¹² to create SEER*Stat¹³ databases.

Statistical Analysis

We calculated incidence rates and their 95% confidence intervals for cases diagnosed during the period of 1996–2004 by directly age-adjusting to the 2000 US standard population using 5-year age groups using SEER*Stat software.¹³ We computed incidence by age (15–44 years, 45–64 years, and 65 years), age-adjusted within each age-group, by histological subtype, and by SEER historic stage when possible. All incidence rates based on 10 cases are shown and expressed per 100,000 woman-years. A uniform scaling ratio (1 log cycle on the y-axis has the same length as 40 years on the x-axis, with a 10-degree slope representing an annual change of 1%) was used to facilitate comparison among figures.¹⁴

RESULTS

We first compared incidence of cervical cancer across the 12 SEER registries to the 5 SEER registries with which we conducted our analysis of rates among Asian ethnic groups. In both comparisons, Hispanic women had the highest incidence of invasive cervical cancer, followed by black, Asian, and white women (Table 1). This pattern was consistent for SCC but not for adenocarcinoma. Although Hispanic women also had the highest incidence of adenocarcinoma, this was followed by white, Asian or Pacific Islanders, and then black women. Although the race-specific patterns were generally similar between the SEER-12 and SEER-5 registries, the rate among black women was 16% higher in the SEER-12 compared with the SEER-5.

Among the 6 Asian ethnic groups, Vietnamese and Korean women had the highest cervical cancer rates overall (18.9 and 11.9, respectively) and for the major subtype, SCC (13.4 and 9.4, respectively) (Table 1). The highest adenocarcinoma rates were among Vietnamese (3.7) and Filipina women (2.2). Notably, rates overall and for each type were higher among Vietnamese women than Hispanic women. Asian Indian/Pakistani women had the lowest rates of cervical cancer overall (4.5) and SCC (3.4), even lower than those among white women; there were too few adenocarcinoma cases to estimate a stable rate in this group.

By stage, Vietnamese women had the highest incidence of localized and regional SCC, followed by Korean and Filipina women (Table 2). The rate among Vietnamese women was higher than that for Hispanics for localized and regional SCC. Chinese and Japanese women had the lowest rates of SCC for each stage, all of which were lower than rates among white women except for regional disease among Chinese women. Although Asian/Pacific Islanders had higher SCC rates at all stages than white women, their adenocarcinoma rates were equivalent. However, by Asian ethnic group, Vietnamese, Filipina, and Korean women had higher localized adenocarcinoma rates than other Asians or Pacific Islanders.

By age, SCC rates peaked at ages 45 to 64 years among white women, reflecting screening efforts that detect cancer early with effective treatment and follow-up (Fig. 1 Left). Among Hispanics, blacks and Asians, SCC rates plateaued by age 45 years. By Asian ethnic groups, however, the plateau/decline in SCC incidence is apparent only among Japanese women (Fig. 1 Right), whereas SCC incidence rates among Vietnamese, Korean, Filipina, and Chinese women continued to increase with age. The small numbers of SCC among Asian Indian/Pakistani women and adenocarcinoma among all Asian ethnic groups did not permit us to present the age-specific data graphically.

Age-specific SCC incidence curves stratified by stage further reveal that the plateau after ages 45 to 64 years observed in whites occurs across all stages—localized, regional, and distant (Fig. 2). Notably, the same incidence plateau is apparent among black and Asian women for localized disease but not for regional, distant, or unstaged disease. By Asian ethnic group, rates declined for both localized and regional disease only among Japanese women. Although an incidence plateau is also apparent among Filipina women with localized disease, an increase beyond ages 45 to 64 years is apparent for regional disease. Among Vietnamese, Korean, and Chinese women, rates rose across all ages for localized and regional disease. Again, the small numbers of SCC among Asian Indian/Pakistani women and adenocarcinoma among all Asian ethnic groups did not permit us to evaluate the parallel age-specific curves by stage.

DISCUSSION

In our analysis of cervical cancer incidence rates among 6 Asian ethnic groups in 5 US SEER registries, we found that although Asians in aggregate are often reported to have lower rates than blacks and Hispanics, the rates among Vietnamese women were higher than both blacks and Hispanics, whereas Korean women had rates similar to blacks. In our analysis, which in addition considered histology, stage, and age, we found that Vietnamese, Korean, and Filipina women had among the highest rates of cervical cancer for both

histologic types. In general, incidence rates and patterns for adenocarcinoma mirrored those for SCC.

Interestingly, although women in India have relatively high rates of cervical cancer,¹⁵ Asian Indian women residing in the United States had the lowest rates of both SCC and adenocarcinoma in our data, consistent with the initial report based on data from California.⁷ Access to screening and healthcare across Asian populations have been shown to vary widely.¹⁶ This is further supported by our analysis of disease stage, in which cervical cancer incidence rates continue to rise with age for Vietnamese, Korean, Filipina, and Chinese women, in contrast to the expected plateau and drop in incidence after ages 45 to 64 years because of the early screening and detection programs in the United States that are clearly exemplified among white women. Only among Japanese women did incidence decline with age. Perhaps not coincidentally, this is the Asian ethnic group with the longest history in the United States, and is considered to be more acculturated to the US culture than other Asian groups. Other Asian ethnic groups comprise more recent US migrants, and, as adherence to Eastern cultural views is associated with decreased screening for cervical cancer, their increasing rates of both localized and regional disease with age support the need for continued screening and effective follow-up into older age groups.¹

Our data clearly support the notion that the umbrella category of Asian/Pacific Islander obscures important variations within this group. Cultural differences among Vietnamese women with regard to cervical cancer screening have been documented^{17,18} and may account for the high cervical cancer rates in the United States. That their incidence in the United States is similar to or, in some cases, even higher, than among women in Vietnam¹⁹ suggests that both etiologic and cultural/behavioral factors are retained upon migrating to the United States. The continued rise in cervical cancer incidence with age and by all stages for both SCC and adenocarcinoma strongly suggest a barrier to screening that is either cultural and/or because of lack of access to healthcare. In contrast, although women in India have very high cervical cancer rates, Asian Indian women residing in the United States have among the lowest rates, even lower than those among whites, perhaps reflecting a pattern of higher socioeconomic status among Asian Indian women who migrate to the United States compared with those who do not migrate.⁷ Chinese and Japanese have low rates of cervical cancer in the United States and in their country of origin,¹⁵ suggesting similar prevalence of etiologic risk factors (human papillomavirus [HPV] prevalence and/or HPV cofactors such as smoking). However, despite substantially lower incidence rates of cervical cancer among US Chinese, Japanese, Korean, and Filipina women compared with their ethnic counterparts residing in their countries of origin,¹⁵ their increasing incidence rates with age across disease stages suggests that barriers still exist for cervical cancer screening and/or effective follow-up. Such barriers may be cultural in origin, because older US Asians tend to have immigrated later in life, and thus may be more likely to retain their cultural values and views regarding disease and wellness.

Our study strengths include use of the well-maintained, reliable data sources in our analysis. As described previously,⁶ we believe our case data are an accurate reflection of Asian incidence rates in the United States outside of our selected 5 SEER cancer registries, as they together account for 58% of the total Asian population in SEER registry areas and 31% of

the total Asian population in the United States.²⁰ Importantly, our use of the average population (between single and multiple races) enabled use of all available data, although results were similar in analyses restricted to single or multiple ethnic groups. Limitation of our study include our inability to evaluate time trends because of changes in the reporting of Asian ethnicity (eg, the 1990 census comprised single race groups vs the 2000 census, where individuals could self-identify with multiple races) and difficulties in estimating annual populations, as well as potential misclassification of race and ethnicity data.^{4,21} We also did not have HPV type data to evaluate potential differences in HPV type prevalence by race or Asian ethnic group. Finally, we did not adjust for hysterectomy rates in the current analyses, which would likely increase rates because of the decline in the total woman-years at risk, but might do so differentially by race.

In conclusion, the results of the current study found that racial and ethnic incidence rates for cervical carcinoma vary considerably among the racial groups and within Asian ethnic groups. Most notably, sustained increases in incidence rates were demonstrated with age, among all Asian ethnic groups except Japanese, and across all stages and histologic subtypes. These differences suggest varying prevalence of etiologic risk factors including HPV infection and HPV cofactors coupled with differential access to screening and follow-up healthcare. In considering effective cervical cancer screening and prevention efforts with HPV vaccination, our data strongly suggest that such efforts will need to be tailored toward the different Asian ethnic groups, and certainly will have to take cultural factors into consideration. Our data also point to older Asian populations as a particularly vulnerable group, especially because this segment of the population may be more likely to encounter cultural and institutional barriers to receiving timely early detection measures; additional research needs to be focused on older Asians to identify the specific factors contributing to their increased incidence rates.

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Figure 1.

Surveillance, Epidemiology, and End Results (SEER) incidence rates for squamous cell carcinoma of the cervix by (*Left*) race and (*Right*) 6 Asian ethnic groups (1996–2004; derived from SEER-5 custom database). SEER-12 does not include data from the Alaska SEER registries.

Figure 2. Surveillance, Epidemiology, and End Results (SEER) incidence rates for squamous cell carcinoma of the cervix by age and stage for 6 Asian ethnic groups (1996–2004; derived from SEER-5 custom database). SEER-12 does not include data from the Alaska SEER registries.

Table 1

SEER Incidence Rates for Invasive Cervical Carcinoma (Total and by Histologic Subtype) for SEER-12^a and SEER-5^b Registries by Race and Asian Ethnic Group, 1996–2004

	Total		Squamous Cell Carcinoma		Adenocarcinoma		Other, Specified		Not Specified or Poorly Specified	
	No. ^c	Rate ^d	No.	Rate	No.	Rate	No.	Rate	No.	Rate
SEER-12										
White	8072	7.3 (7.15–7.48)	5189	4.7 (4.59–4.85)	1898	1.7 (1.64–1.80)	492	0.5 (0.41–0.49)	493	0.4 (0.39–0.47)
Black	2013	11.5 (11.00–12.03)	1537	8.7 (8.25–9.14)	230	1.4 (1.21–1.57)	102	0.6 (0.48–0.71)	144	0.9 (0.72–1.01)
Hispanic	3815	15.5 (15.00–16.04)	2825	11.5 (11.07–11.97)	610	2.4 (2.24–2.65)	230	0.9 (0.80–1.05)	150	0.6 (0.54–0.76)
Asian or Pacific Islander	1776	9.2 (8.75–9.61)	1226	6.4 (6.01–6.73)	362	1.8 (1.65–2.04)	96	0.5 (0.39–0.59)	92	0.5 (0.39–0.60)
SEER-5										
White	3530	7.1 (6.86–7.34)	2279	4.6 (4.41–4.79)	833	1.7 (1.56–1.79)	224	0.5 (0.39–0.52)	194	0.4 (0.33–0.44)
Black	700	9.9 (9.17–10.66)	532	7.5 (6.85–8.15)	94	1.4 (1.10–1.66)	37	0.5 (0.36–0.71)	37	0.5 (0.38–0.75)
Hispanic	3123	16.6 (16.00–17.24)	2304	12.3 (11.76–12.82)	503	2.6 (2.39–2.88)	202	1.1 (0.91–1.23)	114	0.6 (0.52–0.77)
Asian or Pacific Islander	1621	9.1 (8.71–9.61)	1119	6.3 (5.97–6.72)	334	1.9 (1.67–2.08)	85	0.5 (0.38–0.59)	83	0.5 (0.38–0.59)
SEER-5 custom^e										
Asian Indian/Pakistani	30	4.5 (2.96–6.68)	22	3.4 (2.05–5.31)	7	—	0	—	<5	—
Chinese	280	5.8 (5.12–6.5)	191	4.0 (3.41–4.56)	62	1.3 (0.97–1.63)	11	0.2 (0.12–0.42)	16	0.3 (0.18–0.53)
Filipino	420	10.0 (9.06–11.02)	279	6.7 (5.95–7.57)	96	2.2 (1.77–2.67)	28	0.7 (0.44–0.97)	17	0.4 (0.25–0.71)
Japanese	175	6.2 (5.27–7.21)	116	4.1 (3.38–4.97)	38	1.3 (0.91–1.83)	7	—	14	0.5 (0.27–0.88)
Korean	187	11.9 (10.24–13.80)	146	9.4 (7.88–11.06)	29	1.7 (1.16–2.52)	7	—	5	—
Vietnamese	178	18.9 (16.02–22.11)	121	13.4 (10.99–16.26)	39	3.7 (2.57–5.16)	8	—	10	0.9 (0.41–1.66)

SEER indicates Surveillance, Epidemiology, and End Results.

^aSEER-12 includes data from the 13 SEER registries except the Alaska SEER registry.

^bSEER-5 only includes data from Hawaii, Los Angeles, Seattle-Puget Sound, San Francisco-Oakland, and San Jose-Monterey.

^cCase counts of <5 were not presented to prevent the possibility of patient identification.

^dRates with case counts of 10 are shown and expressed per 100,000 woman-years and age-adjusted to the 2000 US standard population.

^eSubset of SEER-5 Asian or Pacific Islander group. Custom population counts were used to create rates for 6 Asian ethnic groups; data for Asian Indian or Pakistani and Vietnamese were not available for Hawaii.

Table 2

SEER Incidence Rates for Invasive Cervical Carcinoma (Total and by Histologic Subtype) for SEER-5^a Registries by Race and Asian Ethnic Group and by Stage, 1996–2004^b

SEER-5	Localized		Regional		Distant		Unstaged	
	No. ^c	Rate ^d	No.	Rate ^d	No.	Rate ^d	No.	Rate ^d
Squamous cell carcinoma								
White	1222	2.5 (2.40–2.68)	777	1.5 (1.41–1.63)	224	0.4 (0.38–0.49)	56	0.1 (0.08–0.15)
Black	251	3.4 (3.02–3.89)	204	2.9 (2.52–3.33)	49	0.7 (0.53–0.95)	28	0.4 (0.27–0.60)
Hispanic	1162	5.7 (5.39–6.09)	859	4.9 (4.60–5.30)	191	1.1 (0.95–1.28)	92	0.5 (0.40–0.63)
Asian or Pacific Islander	554	3.1 (2.82–3.34)	449	2.6 (2.36–2.84)	86	0.5 (0.39–0.61)	30	0.2 (0.12–0.25)
Asian Indian/Pakistani	11	1.7 (0.77–3.10)	8	1.4 (0.56–2.82)	<5	—	0	—
Chinese	85	1.7 (1.37–2.12)	85	1.8 (1.43–2.22)	11	0.2 (0.12–0.42)	10	0.2 (0.01–0.40)
Filipino	121	2.8 (2.33–3.36)	129	3.2 (2.66–3.81)	25	0.6 (0.40–0.92)	<5	—
Japanese	65	2.4 (1.85–3.10)	38	1.3 (0.89–1.78)	10	0.3 (0.15–0.63)	<5	—
Korean	72	4.5 (3.49–5.68)	54	3.5 (2.59–4.55)	14	0.9 (0.51–1.61)	6	—
Vietnamese	68	7.3 (5.56–9.38)	48	5.7 (4.07–7.67)	5	—	0	—
Adenocarcinoma								
White	520	1.1 (0.98–1.17)	199	0.4 (0.33–0.44)	92	0.2 (0.14–0.22)	22	0.0 (0.03–0.06)
Black	46	0.6 (0.47–0.85)	26	0.4 (0.25–0.57)	18	0.3 (0.16–0.42)	<5	—
Hispanic	311	1.5 (1.30–1.64)	126	0.8 (0.64–0.93)	49	0.3 (0.22–0.40)	17	0.1 (0.05–0.14)
Asian or Pacific Islander	206	1.1 (0.98–1.30)	79	0.5 (0.36–0.56)	41	0.2 (0.16–0.31)	8	—
Asian Indian/Pakistani	5	0.6 (0.16–1.49)	0	—	<5	—	0	—
Chinese	37	0.8 (0.53–1.04)	21	0.4 (0.27–0.68)	<5	—	0	—
Filipino	54	1.2 (0.92–1.60)	25	0.6 (0.37–0.85)	13	0.3 (0.16–0.51)	<5	—
Japanese	17	0.7 (0.38–1.08)	12	0.4 (0.18–0.69)	7	—	<5	—
Korean	20	1.2 (0.71–1.82)	<5	—	<5	—	<5	—
Vietnamese	26	2.4 (1.54–3.56)	7	—	<5	—	<5	—

SEER indicates Surveillance, Epidemiology, and End Results.

^aCustom population counts were used to create rates for 6 Asian ethnic groups (which are a subset of the SEER-5 Asian or Pacific Islander group); data for Asian Indian/Pakistani and Vietnamese were not available for Hawaii.

^bSEER-5 only includes data from Hawaii, Los Angeles, Seattle-Puget Sound, San Francisco-Oakland, and San Jose-Monterey.

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