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Original article

# Disparities in cervical cancer survival among Asian-American women

Van T. Nghiem MSPH [a,b,c], Kalatu R. Davies PhD [a], Wenyaw Chan PhD [d], Zuber D. Mulla PhD [e,f], Scott B. Cantor PhD [a,*]

[a] Department of Health Services Research, The University of Texas MD Anderson Cancer Center, Houston
[b] Center for Health Promotion and Prevention Research, The University of Texas School of Public Health, Houston
[c] Department of Management, Policy and Community Health, The University of Texas School of Public Health, Houston
[d] Department of Biostatistics, The University of Texas School of Public Health, Houston
[e] Department of Obstetrics and Gynecology, Paul L. Foster School of Medicine, Texas Tech University Health Sciences Center, El Paso
[f] Department of Public Health, Graduate School of Biomedical Sciences, Texas Tech University Health Sciences Center, Lubbock

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ABSTRACT

*Purpose:* We compared overall survival and influencing factors between Asian-American women as a whole and by subgroup with white women with cervical cancer.
*Methods:* Cervical cancer data were from the Surveillance, Epidemiology, and End Results registry; socioeconomic information was from the Area Health Resource File. We used standard tests to compare characteristics between groups; the Kaplan-Meier method with log-rank test to assess overall survival and compare it between groups; and Cox proportional hazards models to determine the effect of race and other covariates on overall survival (with and/or without age stratification).
*Results:* Being 3.3 years older than white women at diagnosis ($P < .001$), Asian-American women were more likely to be in a spousal relationship, had more progressive disease, and were better off socioeconomically. Women of Filipino, Japanese, and Korean origin had similar clinical characteristics compared to white women. Asian-American women had higher 36- and 60-month survival rates ($P = .004$ and $P = .013$, respectively), higher overall survival rates ($P = .049$), and longer overall survival durations after adjusting for age and other covariates (hazard ratio = 0.77, 95% confidence interval: 0.68–0.86). Overall survival differed across age strata between the two racial groups. With the exception of women of Japanese or Korean origin, Asian-American women grouped by geographic origin had better overall survival than white women.
*Conclusions:* Although Asian-American women, except those of Japanese or Korean origin, had better overall survival than white women, their older age at cervical cancer diagnosis suggests that they have less access to screening programs.



## Introduction

Cervical cancer is the second leading cause of cancer-related death among women aged 20 to 39 years and has remained a public health problem in the United States. In 2013 alone, 12,340 new cases of cervical cancer were diagnosed, and approximately 4030 women died of the disease [1,2]. Survival durations differ among patients with cervical cancer owing to many factors [3–5], but race or ethnicity is one of the most common predictors of survival. For example, African-American women have been shown to have an increased risk of death from cervical cancer compared to white women, whereas Hispanic women have a decreased risk [3,4]. Although numerous studies have reported survival disparities for African-American and Hispanic women compared to white women [5,6], nationwide cervical cancer survival rates for other racial and ethnic groups, including Asian-American women, have not been reported.

The Asian-American community has rapidly grown over the past decade; a four-fold increase in the population size was observed between 2000 and 2010. Fewer Asian-Americans than

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* Corresponding author. Department of Health Services Research—Unit 1444, The University of Texas MD Anderson Cancer Center, 1515 Holcombe Boulevard, Houston, TX 77030. Tel.: +1-713-563-0020; fax: +1-713-563-0059.
*E-mail address:* sbcantor@mdanderson.org (S.B. Cantor).

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non-Hispanic whites had health insurance coverage (82% vs. 88% in 2011) [7]. As a result, Asian-Americans were less likely to access health care services for prevention and treatment, including cervical cancer screening programs. This disparity represents a significant public health problem, as cancer is the leading cause of death among Asian-American women [8]. This group has a disproportionately high rate of cancers of infectious origin, including cervical cancer [9]; between 1990 and 2008, invasive cervical cancer was one of the five most common cancers in some subgroups of Asian-American women, including those of Cambodian and Korean origin [10]. Furthermore, Southeast Asian women, who have the highest rates of cervical cancer in the United States, have the lowest rates of Papanicolaou smear testing [11]. In general, cervical cancer is a serious problem in the fast-growing Asian-American population, requiring study on a national scale. Numerous studies have addressed the cervical cancer screening among Asian-American women [12–15]. However, there is a lack of knowledge on the survival outcomes of Asian-American women diagnosed with cervical cancer. In addition, for the purposes of cancer control, it is imperative to report disaggregated data of the Asian-American population because this population is heterogeneous and dynamic [16,17]. Consequently, analyses of cervical cancer survival outcomes among subgroups of the Asian-American women at the national level would be of paramount importance.

In this study, we investigated cervical cancer overall survival durations and factors influencing survival among Asian-American women and among women of Asian subgroups in comparisons with non-Hispanic white women. We sought to explore the potential effects of demographics, socioeconomic patterns, and clinical characteristics, which have been suggested as predictors of survival in previous studies [18–22]. We expect that findings from this study would help to better design health interventions and guide future research for cervical cancer prevention and control.

## Materials and methods

### *Study population and data source*

We used records from the National Cancer Institute's Surveillance, Epidemiology and End Results (SEER) registry for the years 1996–2012 [23]. The registry represented approximately 28% of the U.S. population and had wide geographic coverage. The validity and completeness of the SEER database make it a well-known, high-quality source of cancer statistics [24]. The year 1996 was chosen as our starting point because from this year onward, specific ethnic information about patients with Asian origins was recorded. Because patients were not identifiable, our study received exempt status from the Institutional Review Board of The University of Texas MD Anderson Cancer Center.

We extracted the records of Asian-American women (including those of Indian and/or Pakistani, Chinese, Filipino, Japanese, Kampuchean, Korean, Laotian, or Vietnamese origin) and non-Hispanic white women (white women) who had a confirmed diagnosis of cervical cancer during the study period. We collected information about each patient's disease stage at diagnosis (SEER historic stage A), tumor histologic classification, demographic characteristics, and initial treatment. Socioeconomic status was determined using data from the Area Health Resource File database, based on state county code. Information about poverty, education, income, and unemployment at the county level was used to estimate a composite socioeconomic index, as described elsewhere [22]. This index was categorized into four quartiles, the lowest of which was the most socioeconomically disadvantaged. We used the rural and/or urban continuum code to describe the population density of the counties in which the patients resided. In addition, as a surrogate variable to estimate the proportion of our cohort that was foreign-born, we determined the percentage of the population of each county-of-residence woman born outside of the United States and categorized the percentages into one of the four relative quartiles, from lowest to highest. For both databases, we excluded records with missing values for key covariates, including marital status, age at diagnosis, histologic classification of the tumor, type of treatment, and socioeconomic status. Cancer survival outcome variables included vital status and time to event (i.e., the time from the date of diagnosis until death, censoring, or last follow-up).

### *Statistical analysis*

We used the $\chi^2$ test to examine differences by race in the distribution of categorical variables such as demographic characteristics, tumor histologic classification, and type of treatment. The Wilcoxon rank sum test was used to assess differences in the median values of continuous variables (e.g., age at diagnosis).

We used the Kaplan-Meier method to investigate overall survival within each racial group and the log-rank test to examine differences between the groups. Overall survival was calculated in months from the time of diagnosis to death or last follow-up. Patients who were still alive at last follow-up were censored. We compared overall survival rates between racial groups at key time points (36 months and 60 months).

We also conducted univariable and multivariable analyses using Cox proportional hazards regression modeling with overall survival as the evaluable end point. The effect of race on overall survival was examined with the presence of all covariates. This effect was further examined in different age groups and in subgroups of Asian-American women, which were categorized by geographic area of origin and sample size. To evaluate the proportional hazard assumptions for this Cox model, we used Schoenfeld residual analysis.

All analyses were performed in SAS 9.4 (SAS, Cary, NC); a $P$ value less than .05 was considered statistically significant.

## Results

### *Study cohort*

We identified the records of 11,902 women with a cervical cancer diagnosis between 1996 and 2011 (with last follow-ups through 2012) in the SEER database. We excluded 1252 SEER records (11%) that had missing values for at least one variable and another 176 records with missing information in the Area Health Resource File database that prevented us from determining socioeconomic status. Marital status and disease stage at diagnosis were the variables most often missing (718 [6%] for marital status, stage at diagnosis 637 [5%], and treatment type 145 [1%]). Some records were missing values for more than one variable.

We included the records of 10,474 women in the analysis. Among these women, 9408 (90%) were white, and 1066 (10%) were Asian-American (Table 1). Of the Asian-American women, 344 (32%) were of Filipino origin, 236 (22%) were of Chinese origin, 249 (23%) were of North Asian origin (146 of Japanese and 103 of Korean origin), and 206 (19%) were of Southeast Asian origin (137 Vietnamese, 21 Laotian, 26 Kampuchean, and 22 Thai). Only 31 women (3%) were of Asian Indian and/or Pakistani origin. Three hundred forty-nine (33%) of the Asian-American women and 3452 (37%) of the white women had died by the last follow-up, and 60% of all deaths were related to cervical cancer. The proportions of Asian-American women and white women who died of cervical cancer did not differ ($P = .969$).