

Cumulative Incidence Rates of Breast Cancer by Age for Filipinos and Chamorros in Guam

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Abstract

Breast cancer is the second leading cause of cancer-related death among women on Guam and Hawai'i. Breast cancer incidence rates are described here for the multiethnic population in Guam, a United States (US) Pacific island territory, and compared to Hawai'i and other US populations, to understand the risk by age and race/ethnic group in this understudied group. The study included all breast cancer cases (n=576) reported to the Guam Cancer Registry, all breast cancer cases (n=8345) reported to the Hawai'i Tumor Registry and all breast cancer cases (n=678,637) reported to the Surveillance, Epidemiology, and End Results program from 2000 to 2009. Cumulative incidence rates by age were calculated for two time periods: 2000-2004 and 2005-2009. Differences were seen in cumulative incidence rates by age, ethnicity, and place of residence. Cumulative incidence rates by age 40 were the highest (0.7%) among Filipinos in Guam but, after age 40, the rates for Chamorros (indigenous Pacific Islanders of Guam) increased rapidly. The lifetime cumulative incidence rates were the highest for Chamorros in Guam (15.3%), close to the US rate (15.5%). Results were similar for 2005-2009. Women in Guam are at high risk for breast cancer, with the indigenous Chamorros having the highest risk, and the most prevalent Asian group of Filipinos, having a younger age at diagnosis. These patterns are similar to the comparable Pacific Islander and Filipino populations in Hawai'i and the US generally.

Keywords

breast cancer, Pacific Islanders, Chamorros, Filipinos, Hawai'i, Guam, US

Introduction

Breast cancer is thought to be a disease of Western industrialized nations,¹ and is the most common malignancy among women worldwide. In the United States (US), including Hawai'i and the territory of Guam, breast cancer is also the most commonly diagnosed cancer and is the second most common cause of cancer death among women.¹⁻⁴ Women on Guam appear to exhibit slightly lower breast cancer incidence rates than US women in general, and in Guam, the incidence of this cancer varies among the ethnic groups of Guam and may be diagnosed at a younger age. However, women of Guam also have a higher mortality rate for breast cancer compared to women in Hawai'i and the US.⁴⁻⁵ The reasons for high breast cancer incidence and mortality rates among women in Guam are poorly understood.

Guam is located in the northwestern Pacific Ocean, approximately 3,700 miles west of Hawai'i and 1,300 miles southeast of Japan. Chamorros are the original inhabitants of Guam and the other Northern Mariana Islands, though the current population

of Guam is characterized by substantial ethnic variation:⁶ 37% Chamorro, 26% Filipino, 7% White, 7% other Asian, 12% other Pacific Islander, and 11% other ethnicity. This ethnic diversity evolved through centuries of migration that continues today.⁷ In addition, Spanish colonization of Guam, between 1521-1898, and the subsequent US possession since then, has led to ethnic and cultural mixing. Hawai'i also has substantial ethnic diversity as Hawai'i's population is comprised of indigenous Native Hawaiians (21%), Whites (23%), Filipinos (17%), Japanese (16%), Chinese (7%), and other ethnicities (16%).⁸

Cancer incidence rates for specific Asian⁹ and Pacific Islander¹⁰ populations living in the US have been reported elsewhere; and overall cancer rates in Guam and Hawai'i have been reported by Hernandez and colleagues.⁴ The purpose of this paper is to describe breast cancer rates by age and ethnicity of the Asian and Pacific Islander populations in Guam, and to compare them with the rates of comparable ethnic groups in Hawai'i, as another multiethnic Pacific population, and with the overall US population. Cumulative incidence rates (CIRs) by age are reported, as they are more stable compared to age-specific rates and thus are suitable for smaller populations such as Guam.

Methods

We obtained data from the Guam Cancer Registry (GCR) for all reportable cancer diagnoses for Guam. For comparison, we obtained the Hawai'i Tumor Registry (HTR) data and US national data on all female breast cancers from eighteen registries in the National Cancer Institute's Surveillance, Epidemiology, and End Results (SEER) program, including HTR, from January 1, 2000 through December 31, 2009. These eighteen registries cover approximately 28% of the US population and >28% of the Asian and Pacific Islander populations in the US. Therefore, this study included all breast cancer cases (n=576) reported to the GCR, all breast cancer cases (n = 8345) reported to the HTR and all breast cancer cases (n=678,637) reported to the NCI SEER from 2000-2009. The GCR provides demographic, tumor and survival information on cancer cases diagnosed since 1998.¹¹ GCR's membership in the North American Association of Central Cancer Registries (NAACCR) and the US Pacific Regional Central Cancer Registry (PRCCR) assures that cancer data collected by GCR is completed in a manner which meets the exacting standards set by NAACCR and NCI SEER research programs.¹¹

Cumulative incidence rates are weighted sums of age-specific

incidence rates R_A , $CIR = \sum_{A=1}^m \omega_A R_A$, in which the weights ω_A are the lengths of the age intervals, and m varies from 0-24 up to 0-85. We stratified the rates by Chamorro and Filipino ethnicity, with the time period based on the year of diagnosis (2000-2004, 2005-2009), and location. Average annual age-specific rates were computed as input per strata and 5-year age group, where the numerators were the sum of counts of breast cancer cases per year and denominators were the sum of the female population sizes per year, within the appropriate strata;

that is $R_A = \frac{d_A}{S_A}$, where $d_A = \sum_{y=1}^p d_{Ay}$ is the sum of events

for age group A across the years of interest and $S_A = \sum_{y=1}^p S_{Ay}$ is the sum of the populations for age group A across the years of interest. We used the US 2000 and 2010 census data to compute the denominators. For each strata, yearly counts of the size of the population by age group from 2000 to 2010 were estimated by interpolation between the census years; the counts were then aggregated into the two time periods to serve as denominators. The standard error for the cumulative incidence rate is

$SE(CIR) = \sum_{A=1}^m \omega_A^2 \left(\frac{d_A}{S_A^2} \right)$. The CIR's were compared between ethnicities, location, and year period using negative binomial regression using $\log(S_A)$ as an offset variable.

Results

Remarkable differences were seen in cumulative incidence rates by age and ethnicity. During the 2000-2004 time period, the cumulative incidence rates up to age 40 were the highest (0.68%) among Filipinos in Guam, which was almost three-fold higher than the rate among Chamorros (0.24%) (P -value = .32) (Table 1). Filipinos in Hawai'i and the US had similar cumulative rates for the same age group (0.65% and 0.47%, respectively). These data support earlier evidence that Filipino women are being diagnosed at younger ages than their Asian and Caucasian counterparts.¹² After age 40, the rates for Chamorros increased rapidly. The lifetime cumulative incidence rate (age 0-85) for Chamorros (15.3%) was close to the overall US rate (15.5%). Interestingly, there was a marked difference in lifetime cumulative incidence rates between Filipino women by location. Filipinos in Guam had the lowest rate (9.3%), followed by Filipinos in Hawai'i (10.5%) ($\beta=1.98$, P -value<.001) and

in the US (11.7%) ($\beta=4.06$, P -value<.001). Differences were observed between rates of Chamorros and Native Hawaiians, both Pacific Islanders. Native Hawaiians had higher cumulative incidence rates than Chamorros, both up to age 40 (0.65% and 0.24%, respectively, $\beta=1.77$, P -value=.036) and for lifetime risk (22.3% and 15.3%, $\beta=1.33$, P -value=.001). The risk among Native Hawaiians particularly differed from that of Chamorros at ages 60-64. Similar results were found for the 2005-2009 time period (Figure 1, Table 1).

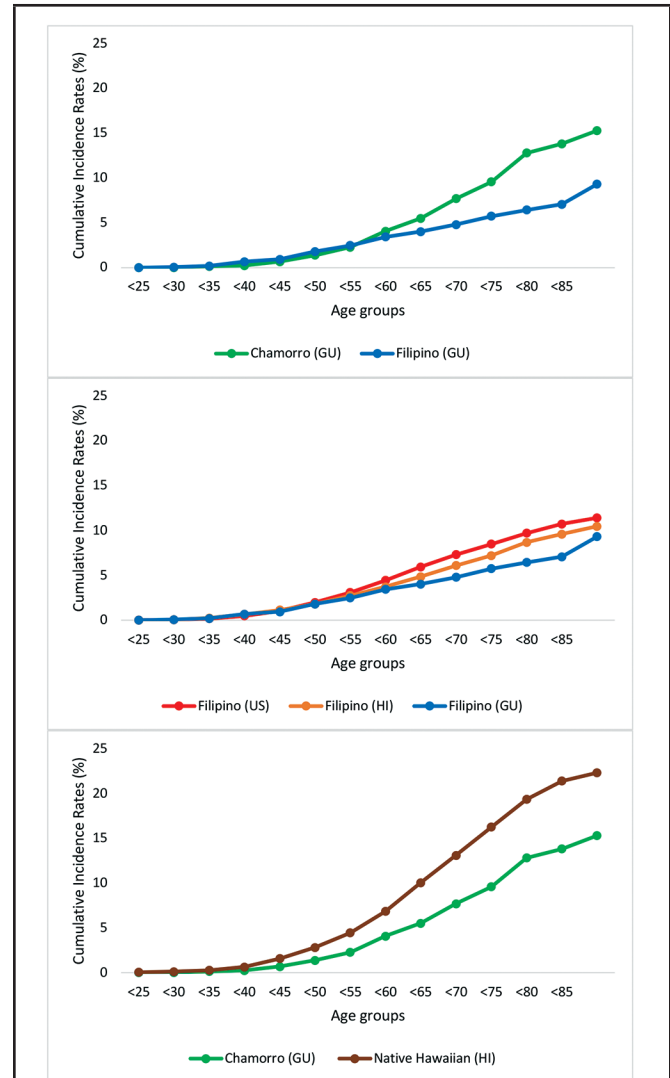


Figure 1. Lifetime (0-85) Cumulative Incidence Rates 2000-2004 by Different Ethnic Groups and Geographic Location

Table 1. Invasive Breast Cancer Cumulative Incidence Rates (%) with 95% CI							
Between 2000-2004							
Age groups	US	Guam	Filipino (US)	Filipino (HI)	Filipino (GU)	Chamorro (GU)	Native Hawaiian (HI)
	Rate (95% CI)	Rate (95% CI)	Rate (95% CI)	Rate (95% CI)	Rate (95% CI)	Rate (95% CI)	Rate (95% CI)
20-24	0.0 (0.006, 0.007)	0.0	0.0 (0.00, 0.009)	0.0	0.0	0.0	0.0 (0.00, 0.09)
25-29	0.0 (0.039, 0.044)	0.0 (0.00, 0.05)	0.0 (0.02, 0.06)	0.0 (0.00, 0.09)	0.1 (0.00, 0.20)	0.0	0.1 (0.04, 0.18)
30-34	0.2 (0.16, 0.17)	0.1 (0.05, 0.25)	0.2 (0.15, 0.22)	0.2 (0.13, 0.34)	0.2 (0.00, 0.41)	0.1 (0.00, 0.32)	0.3 (0.17, 0.39)
35-39	0.4 (0.43, 0.44)	0.4 (0.21, 0.52)	0.5 (0.42, 0.53)	0.6 (0.47, 0.83)	0.7 (0.28, 1.08)	0.2 (0.03, 0.46)	0.6 (0.47, 0.82)
40-44	1.0 (0.98, 1.00)	0.7 (0.51, 0.96)	1.0 (0.94, 1.09)	1.1 (0.90, 1.37)	0.9 (0.46, 1.42)	0.7 (0.31, 1.05)	1.6 (1.29, 1.84)
45-49	1.9 (1.85, 1.88)	1.5 (1.14, 1.81)	2.0 (1.87, 2.09)	1.8 (1.51, 2.12)	1.8 (1.12, 2.48)	1.4 (0.84, 1.93)	2.8 (2.45, 3.20)
50-54	3.0 (2.94, 2.98)	2.2 (1.77, 2.64)	3.1 (2.95, 3.23)	2.7 (2.26, 3.12)	2.5 (1.67, 3.29)	2.3 (1.55, 3.01)	4.5 (3.97, 4.94)
55-59	4.4 (4.37, 4.42)	3.4 (2.82, 4.01)	4.4 (4.26, 4.62)	3.7 (3.28, 4.19)	3.4 (2.43, 4.44)	4.1 (2.95, 5.20)	6.8 (6.19, 7.48)
60-64	6.0 (5.98, 6.02)	4.4 (4.02, 4.80)	5.9 (5.81, 6.07)	4.9 (4.32, 5.41)	4.0 (3.55, 4.50)	5.5 (4.73, 6.30)	10.0 (9.17, 10.91)
65-69	7.8 (7.74, 7.81)	5.8 (4.94, 6.75)	7.3 (7.05, 7.57)	6.1 (5.46, 6.75)	4.8 (3.53, 6.08)	7.7 (5.92, 9.49)	13.1 (12.01, 14.20)
70-74	9.7 (9.63, 9.71)	7.4 (6.22, 8.48)	8.5 (8.21, 8.80)	7.2 (6.47, 7.95)	5.7 (4.23, 7.26)	9.6 (7.42, 11.75)	16.3 (14.93, 17.57)
75-79	11.8 (11.73, 11.83)	9.5 (7.98, 11.02)	9.7 (9.38, 10.06)	8.7 (7.81, 9.57)	6.5 (4.64, 8.26)	12.8 (9.92, 15.70)	19.4 (17.80, 20.91)
80-84	13.9 (13.79, 13.91)	10.7 (8.83, 12.49)	10.7 (10.34, 11.12)	9.6 (8.59, 10.62)	7.1 (4.89, 9.26)	13.8 (10.62, 17.04)	21.4 (19.64, 23.15)
>85	15.5 (15.45, 15.57)	12.6 (10.08, 15.03)	11.6 (11.15, 12.05)	10.5 (9.33, 11.63)	9.3 (5.52, 13.13)	15.3 (11.50, 19.11)	22.3 (20.46, 24.47)
Between 2005-2009							
Age groups	US	Guam	Filipino (US)	Filipino (HI)	Filipino (GU)	Chamorro (GU)	Native Hawaiian (HI)
	Rate (95% CI)	Rate (95% CI)	Rate (95% CI)	Rate (95% CI)	Rate (95% CI)	Rate (95% CI)	Rate (95% CI)
20-24	0.0 (0.006, 0.008)	0.0	0.0 (0.003, 0.022)	0.0	0.0	0.0	0.01 (0.00, 0.03)
25-29	0.0 (0.04, 0.05)	0.0 (0.00, 0.08)	0.1 (0.032, 0.068)	0.1 (0.01, 0.11)	0.0	0.0	0.07 (0.01, 0.12)
30-34	0.2 (0.17, 0.18)	0.1 (0.04, 0.25)	0.2 (0.13, 0.19)	0.2 (0.10, 0.30)	0.1 (0.00, 0.22)	0.1 (0.00, 0.25)	0.2 (0.12, 0.33)
35-39	0.4 (0.43, 0.44)	0.4 (0.25, 0.59)	0.4 (0.37, 0.47)	0.6 (0.46, 0.80)	0.5 (0.12, 0.81)	0.3 (0.03, 0.47)	0.5 (0.38, 0.69)
40-44	1.0 (0.99, 1.01)	0.9 (0.64, 1.14)	1.0 (0.92, 1.07)	1.3 (1.08, 1.58)	1.0 (0.48, 1.45)	0.7 (0.34, 1.09)	1.4 (1.11, 1.61)
45-49	1.9 (1.86, 1.89)	1.3 (1.04, 1.66)	1.9 (1.83, 2.04)	2.1 (1.82, 2.47)	1.5 (0.87, 2.08)	1.2 (0.72, 1.71)	2.6 (2.23, 2.93)
50-54	2.9 (2.88, 2.92)	2.2 (1.74, 2.57)	3.0 (2.87, 3.13)	3.2 (2.77, 3.56)	1.9 (1.21, 2.60)	2.3 (1.62, 3.06)	4.2 (3.73, 4.65)
55-59	4.2 (4.14, 4.19)	3.2 (2.69, 3.76)	4.3 (4.16, 4.48)	4.3 (3.86, 4.78)	2.8 (1.94, 3.70)	3.6 (2.69, 4.59)	6.2 (5.64, 6.79)
60-64	5.7 (5.66, 5.69)	3.9 (3.58, 4.16)	5.7 (5.60, 5.80)	5.3 (4.78, 5.81)	3.1 (2.79, 3.38)	4.6 (3.99, 5.12)	8.8 (8.06, 9.50)
65-69	7.4 (7.38, 7.45)	4.9 (4.12, 5.72)	7.3 (7.09, 7.55)	6.8 (6.20, 7.44)	3.7 (2.63, 4.78)	5.7 (4.36, 7.11)	12.1 (11.13, 13.06)
70-74	9.2 (9.19, 9.27)	5.9 (4.98, 6.88)	8.7 (8.39, 8.92)	8.3 (7.52, 9.00)	5.0 (3.62, 6.45)	6.6 (5.01, 8.13)	15.4 (14.21, 16.66)
75-79	11.2 (11.14, 11.24)	7.1 (5.95, 8.28)	9.9 (9.55, 10.17)	9.8 (8.97, 10.71)	5.6 (3.96, 7.15)	8.0 (6.06, 9.92)	18.3 (16.89, 19.76)
80-84	13.2 (13.11, 13.22)	8.6 (7.03, 10.10)	11.0 (10.60, 11.31)	11.0 (10.03, 12.02)	6.0 (4.19, 7.84)	10.9 (8.00, 13.76)	20.2 (18.62, 21.80)
>85	14.8 (14.70, 14.83)	11.5 (9.11, 13.85)	11.7 (11.34, 12.13)	11.4 (10.38, 12.45)	6.8 (4.40, 9.28)	15.0 (10.82, 19.27)	21.2 (19.56, 22.92)

Discussion

Other reports during the past three decades have found the incidence and mortality rates for breast cancer to be lower in Guam than in the US overall, although availability of mammography has been limited in Guam so under-diagnosis is a possibility. However, breast cancer risk is increasing among women on Guam as reflected in a rise increase in both incidence and mortality rates,¹³ possibly fueled by a more Westernized lifestyle as well as by increased mammography screening. A similar transition occurred between 1975-2005 in Hawai'i in Filipino and Native Hawaiian women.^{14,15}

We found that Filipinos in Guam have a relatively younger age at diagnosis, but a lower lifetime risk of breast cancer than Chamorros, and a somewhat lower highest lifetime risk of breast cancer compared to Filipinos in Hawai'i and the US generally. Chamorros, while having the highest risk of breast cancer among ethnic groups in Guam, had consistently lower risk across age groups compared to Native Hawaiians in Hawai'i.

The incidence and mortality rates for breast cancer have consistently been found to be high in Guam among Chamorros and low in Filipinos.^{5,13,16,17} The reasons for these higher breast cancer rates among Chamorro Pacific Islanders on Guam are poorly understood, as historically no studies have been completed in Guam to examine breast cancer risk factors. A recent breast cancer case-control study in the Northern Marianas found no risk factors specific to this ethnic group.¹¹

The differences between the rates of Filipinos by location could represent a difference in founder populations with differing breast cancer rates from those in the Philippines, or a varying level of acculturation between populations. A founder population is a group of migrants who become isolated from their parent population and that found a new population that more closely resembles the migrant than parent group. However, the Filipinos living in Guam and Hawai'i are predominantly from rural areas of the Philippines, so founder population location is unlikely to be the reason for differences between these groups. The Filipinos in Guam include a somewhat higher proportion of first generation migrants: 69% compared to 53% for Hawai'i and 66% for the US overall, in the 2010 census data.¹⁸ Giving support to this hypothesis, the percentage of Filipinos over the age of five that speak a Filipino language at home is 80% in Guam, 58% in Hawai'i, and 65% in the US overall, according to 2010 census data. Therefore, the lower breast cancer rates in Guam could be due to less acculturation to western lifestyle and closer proximity to the Philippines (1551 miles apart), allowing for more cross-cultural exchange. This mirrors the trends found in a recent migrant study.¹²

The younger age at diagnosis was found in a literature review of breast cancer studies of Filipinos living in the US⁸ and might be due to a longer immigration history, as seen among Japanese

and Filipinos, and is thought to be related to the adoption of western behaviors that increase breast cancer risk, such as a later age at childbirth, lower parity, and higher body weight.¹⁵ In addition, Filipino women are at increased risk, compared to their Asian-American cohort, of developing more aggressive breast cancer,¹² such as human epidermal growth factor receptor 2 (HER2) subtype.¹⁹ The recent breast cancer case-control study in the Northern Marianas found that larger waist circumference was a strong risk factor among Filipinas.¹¹

The two Pacific Island ethnic groups included in this report have different origins, as Native Hawaiians are Polynesians and Chamorros are Micronesians. Another Polynesian ethnic group, Samoans, have also been found to have high rates of breast cancer.¹⁰ There is little information available on the cancer rates of other Micronesian groups.

A strength of this report is that the incidence rates are based on complete cancer registration in Guam and Hawai'i, as well as extensive coverage of cancer cases in the US generally. A limitation is that Pacific Islander and Filipino populations are internally diverse and the populations described here may not represent all subgroups.

The observed disparities in breast cancer incidence among ethnic groups suggests ethnic differences in exposure or response to risk factors. Description of these populations has not been possible previously due to low mammography rates, lack of comprehensive cancer registry information, and the difficulty of calculating rates in small populations. These factors are still limitations that continue to be strengthened. Further study is needed to examine differences in risk behaviors between Filipinos and Chamorros in Guam, and between Filipinos in Guam and in other US locations.

Conflict of Interest

The authors declare no potential conflicts of interest.

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