Ethnicity and Breast Cancer in Hawaii: Increased Survival but Continued Disparity

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Objectives: To examine ethnic variation in survival among 7722 women diagnosed with invasive breast cancer in Hawaii between 1990 and 2002 and to extend previous multivariate analyses by adding a new prognostic variable: estrogen receptor/progesterone receptor (ER/PR) status.

Design: Cox regression analysis of retrospective data.

Setting: Population-based data from the Hawaii Tumor Registry, which is part of the National Cancer Institute's Surveillance, Epidemiology, and End Results Program.

Participants: 7722 women in 5 ethnic groups—Caucasian, Chinese, Japanese, Filipino, and Native Hawaiian—diagnosed with invasive breast cancer between 1990 and 2002.

Main Outcome Measure: Survival, examining death from breast cancer and death from a cause other than breast cancer.

Results: Compared to Caucasians, significantly smaller proportions of Japanese and Chinese women and larger proportions of Native Hawaiian and Filipino women were diagnosed in later stages of disease and at earlier ages. The four minority ethnic groups had higher rates of ER+PR+ tumors than Caucasians. For both causes of death, ethnic disparities in survival were reduced, but still existed, after controlling for age, stage, and ER/PR status. Japanese had the highest rates of survival for either cause of death. Native Hawaiians and Filipinos had the lowest rates of survival for breast cancer, and Native Hawaiians and Caucasians had the lowest rates of survival for other causes of death.

Conclusions: Future studies should examine other reasons for continued ethnic differences in breast cancer survival in Hawaii, including socioeconomic status, access to insurance, adequacy of recommended screening frequency, comorbid conditions, treatment appropriateness and compliance, and genetic markers of tumor aggressiveness. (*Ethn Dis*. 2005;15:453–460)

Key Words: Asian Americans, Mortality, Pacific Islander Americans, Vulnerable Populations

Introduction

With earlier diagnosis and advances in treatment, more women are surviving breast cancer, but ethnic disparities still exist.[1] Of Hawaii's five major ethnic groups—Caucasian (25%), Japanese (25%), Chinese (5%), Filipino (17%), and Native Hawaiian (22%)—research conducted with women diagnosed with breast cancer in the 1980s found that Native Hawaiian, Filipino, and Caucasian women were more likely to be diagnosed with regional or distant breast cancer and were more likely to die from the disease than Chinese and Japanese women.[2,3] These studies also found that ethnic disparities in survival in Hawaii were reduced when age and stage at diagnosis were controlled for statistically, and as much as 44% of the ethnic variation in breast cancer survival was attributable to differences in stage at diagnosis.[2,3] However, these studies did not explain ethnic variation in survival among women diagnosed at the same stage of disease, and Meng et al's estimates of five-year breast cancer survival for women diagnosed in the 1980s ranged from .85 for Native Hawaiians to .91 for Japanese after controlling for stage (localized, regional, distant), menopausal status (above or below age 50), marital status, and geographic residence.[2] The aims of this study were to reexamine ethnic differences in survival of women diagnosed since 1990 and to extend previous survival analyses by examining another prognostic variable: estrogen receptor (ER) and progesterone receptor (PR) status.

Estrogen receptor (ER) and progesterone receptor (PR) status are used to inform breast cancer treatment, and women with ER+PR+ tumors usually have a better prognosis than women with ER−PR− tumors.[4,5] Although research suggests that ER+PR+ tumors occur with less frequency in minority women than Caucasians,[4–10] Japanese and Native Hawaiian women appear to be exceptions. In fact, two separate analyses of >90,000 cases of breast cancer from 11 SEER registries in the United States found that ER+PR+ tumors occur with similar frequency in Japanese (66%–67%), Hawaiian (68%–69%), and Caucasian (64%–67%) women, compared to much lower rates in African-American women (48%–52%).[5,6]

This paper presents a cross-ethnic comparison of age and stage at diagnosis, ER/PR status, and survival in a multiethnic sample of 7722 women diagnosed with breast cancer in Hawaii from 1990 to 2002. Cox regression was used to determine if previously reported ethnic disparities in survival were reduced with the inclusion of ER/PR status, as well as age and stage at diagnosis. Our study builds on a previous comparison of survival by patient and tumor characteristics for 4583 women diagnosed between 1990 and 1997 with breast cancer at TNM (primary tumor, regional lymph nodes, and distant metastasis)

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stages 0 through IV, which found that, with a few exceptions, greater proportions of Native Hawaiian women were diagnosed at more advanced stages of disease and at earlier ages compared to women of other ethnicities, and smaller proportions of Native Hawaiians survived 5 years after diagnosis in each stage and age group.[11]

METHODS

Study Population

A total of 12,366 female breast cancer cases were diagnosed in Hawaii from January 1, 1990, to December 31, 2002, as identified through the Surveillance, Epidemiology, and End Results (SEER) program. We eliminated 871 cases outside the five ethnic categories, 2084 cases with ductal carcinoma in situ (DCIS), and 1689 cases with missing age, staging, or ER/PR data. The final sample of 7722 cases included 2363 (30.6%) Caucasians, 516 (6.7%) Chinese, 2666 (34.5%) Japanese, 847 (11.0%) Filipinos, and 1330 (17.2%) Native Hawaiians (the state's indigenous people who trace their ancestry to the Polynesians inhabiting the islands prior to Western contract in 1778).

Variables

The main variable of interest was ethnicity. Other variables were age at diagnosis, TNM stage, ER/PR status, and survival. The TNM stage was calculated from the extent-of-disease (EOD) code included in the SEER registry. This 7-category staging variable (0, I, IIa, IIb, IIIa, IIIb, and IV) is determined by tumor size (T), lymph node involvement (N), and extent of metastasis (M) according to the American Joint Committee on Cancer (AJCC) guidelines for breast carcinomas[12] and is used by clinicians in making treatment recommendations. Because of the small sample size, stages IIIa and IIIb were combined before analysis and, as noted earlier, cases with DCIS (TNM stage 0) were excluded. Information about ER and PR status is provided in the SEER registry, from which we created a 3-category variable combining ER and PR status: ER−PR−, ER+ or PR+ (including ER+PR− and ER−PR+), and ER+PR+. Length of survival was computed from the diagnosis data and the last active date.

Analysis

Statistical Package for Social Sciences (SPSS, SPSS Inc., Chicago, Illinois) software was used to manage and analyze data.[13] Analysis of variance (ANOVA) and chi-square statistics were used to test for ethnic differences across our variables of interest, including age at diagnosis, age group (<40, 40–49, 50–59, 60–69, and ≥70), TNM stage at diagnosis, ER/PR status, and survival. Associations between mortality rates and ethnicity and other predictors (age, TNM, and ER/PR status) were estimated by using the Cox proportional hazards regression model. The SPSS software was used to compute hazard ratios (HRs) and 95% confidence intervals (CIs) and to evaluate the effects of modifying factors. We employed two models—first adjusting for ethnicity only and then adjusting for ethnicity, age, TNM, and ER/PR status—to assess survival for death from breast cancer and death from another cause. When used as categorical predictors, Caucasian women served as the reference category for ethnicity, ER−PR− was the reference category for ER/PR status, and TNM I was the reference category for stage. Cumulative survival was plotted for each scenario.

RESULTS

Survival status by ethnicity is shown in Table 1. Looking at the sample as a whole, 20.0% died of all causes (9.8% from breast cancer and 10.2% from other causes), 79.2% were alive in 2002, and 0.8% were lost to follow-up. Interethnic comparison shows that 10.1% of Caucasians died from breast cancer, compared with 10.7% of Chinese, 6.6% of Japanese, 13.0% of Filipinos, and 13.0% of Hawaiians.

Bivariate Analysis

Age at diagnosis for the 7722 cases ranged from 22 to 100, with a mean age of 60.1 years (Table 2). Cross-ethnic age differences were significant, with Japanese and Chinese women diagnosed at significantly older ages and Filipino and Native Hawaiian women diagnosed at significantly younger ages than Caucasians ($F=70.4$, $P<.001$). Significant ethnic variations also were seen for TNM stage, with greater proportions of Japanese women diagnosed at early stages, and greater proportions of Native Hawaiian and Filipino women diagnosed at late stages ($\chi^2=168.1$, $P<.001$). More specifically, 61.1% of Japanese women were diagnosed at TNM I compared with 56.2% of Chinese women, 52.1% of Caucasian women, 44.6% of Filipino women, and 45.2% of Native Hawaiian women.

Table 1. Survival status by ethnicity, *N*=7722

	Caucasian (*n*=2363)	Chinese (*n*=516)	Japanese (*n*=2666)	Filipino (*n*=847)	Hawaiian (*n*=1330)	Total (*N*=7722)
Vital status						
Dead	541 (22.9)	99 (19.2)	385 (14.4)	171 (20.2)	345 (25.9)	1,541 (20.0)
Alive	1,796 (76.0)	412 (79.8)	2,274 (85.3)	656 (77.4)	980 (73.7)	6,118 (79.2)
Lost to follow-up	26 (1.1)	5 (1.0)	7 (0.3)	20 (2.4)	5 (0.4)	63 (0.8)
Cause of death						
Breast cancer	239 (10.1)	55 (10.7)	175 (6.6)	110 (13.0)	173 (13.0)	752 (9.8)
Other cause	302 (12.8)	44 (8.5)	210 (7.8)	61 (7.2)	172 (12.9)	789 (10.2)

Only 8.6% of Japanese women were diagnosed at TNM III or IV compared with 11.2% of Caucasians, 12.4% of Chinese, 14.1% of Native Hawaiians, and 14.2% of Filipinos. For all stages combined, 62.7% of Caucasian women were ER+PR+, compared to 70.1% of Native Hawaiian women and 64.1% to 68.1% of women in the other minority groups (χ^2=51.8, P<.001).

Shown in Table 3 are the proportions of women in each ethnic group who died from breast cancer within five years of diagnosis by age group, TNM stage, and ER/PR status. This analysis was limited to 4,078 women diagnosed between 1990 and 1997 for whom five-year follow-up data were available. Overall, 14.4% of the sample died from breast cancer within five years of diagnosis, and ethnic differences were seen in death rates by age group, TNM, and ER/PR status. For example, 31.1% of Native Hawaiians in the <39-year age group died within five years of diagnosis compared to 12.2% of Filipinos and 12.5% of Japanese in that age group. Compared to other ethnicities, Japanese experienced relatively low rates of death within five years of diagnosis in each age stratum, while Native Hawaiians experienced relatively high rates of death. Significant differences were found in the three older age groups (50–59, 60–69, and ≥70), in which the percentages of Hawaiian women dying from breast cancer were 12.1, 11.9, and 4.2 percentage points higher than the percent of Japanese women dying from breast cancer. Looking at TNM, Native Hawaiians had the highest or second highest death rates at TNM I, III, and IV (stages in which ethnic differences were significant). For example, at TNM I, 2.0% of Japanese women were dead within five years of diagnosis compared to 5.1% of Caucasians and 5.2% of Native Hawaiians (χ^2=34.5, P<.001). At TNM III,

Table 2. Mean age at diagnosis, age group, TNM stage at diagnosis, and ER/PR status by ethnicity, for women diagnosed with invasive breast cancer in Hawaii, 1990–2002, *N*=7722

	Caucasian (*n*=2363)	Chinese (*n*=516)	Japanese (*n*=2666)	Filipino (*n*=847)	Hawaiian (*n*=1330)	Total (*N*=7722)
Mean age*	59.8	61.8	62.9	55.9	57.1	60.1
Age range	22–98	27–94	26–100	24–93	23–94	22–100
Age group*						
<39	159 (6.7)	28 (5.4)	96 (3.6)	79 (9.3)	115 (8.6)	477 (6.2)
40–49	473 (20.0)	91 (17.6)	380 (14.3)	210 (24.8)	274 (20.6)	1,428 (18.5)
50–59	571 (24.2)	109 (21.2)	519 (19.5)	237 (28.0)	373 (28.0)	1,809 (23.4)
60–69	490 (20.7)	113 (21.9)	743 (27.9)	179 (21.1)	330 (24.8)	1,855 (24.0)
>70	670 (28.4)	175 (33.9)	928 (34.8)	142 (16.8)	238 (17.9)	2,153 (27.9)
TNM stage*						
I	1,230 (52.1)	290 (56.2)	1,630 (61.1)	378 (44.6)	601 (45.2)	4,129 (53.5)
IIa	598 (23.3)	108 (20.9)	608 (22.8)	232 (27.4)	334 (25.1)	1,880 (24.3)
IIb	270 (11.4)	54 (10.5)	200 (7.5)	117 (13.8)	207 (15.6)	848 (11.0)
III	178 (7.5)	38 (7.4)	156 (5.9)	82 (9.7)	129 (9.7)	583 (7.5)
IV	87 (3.7)	26 (5.0)	72 (2.7)	38 (4.5)	59 (4.4)	282 (3.7)
ER/PR status*						
ER−PR−	458 (19.4)	92 (17.8)	397 (14.9)	186 (22.0)	225 (16.9)	1,358 (17.6)
ER+ or PR+	423 (17.9)	93 (18.0)	453 (17.0)	118 (13.9)	173 (13.0)	1,260 (16.3)
ER+PR+	1,482 (62.7)	331 (64.1)	1,816 (68.1)	543 (64.1)	932 (70.1)	5,104 (66.1)

* P<.001

Table 3. Proportion of women diagnosed with invasive breast cancer in 1990–1997 who died from breast cancer within five years of diagnosis by ethnicity and by age group, TNM stage, and ER/PR status (*N*=4078)

	N	*Caucasian* (*n*=1251)	Chinese (*n*=298)	Japanese (*n*=1421)	Filipino (*n*=429)	Hawaiian (*n*=679)	Total (*N*=4078)
Overall*	4,078	187 (14.9)	46 (15.4)	137 (9.6)	79 (18.4)	137 (20.2)	586 (14.4)
Age group							
<39	279	15 (15.2)	6 (27.3)	7 (12.5)	5 (12.2)	19 (31.1)	52 (18.6)
40–49	781	45 (17.0)	6 (11.8)	25 (11.9)	27 (22.1)	25 (18.7)	128 (16.4)
50–59*	880	41 (14.9)	11 (17.5)	26 (10.6)	25 (22.3)	42 (22.7)	145 (16.5)
60–69*	1,051	32 (11.7)	14 (19.7)	29 (6.7)	13 (14.4)	34 (18.6)	122 (11.6)
70+‡	1,087	54 (15.9)	9 (9.9)	50 (10.5)	9 (14.1)	17 (14.7)	139 (12.8)
TNM stage							
I*	2,103	31 (5.1)	7 (4.3)	17 (2.0)	6 (3.2)	15 (5.2)	76 (3.6)
IIa	951	39 (12.9)	10 (16.7)	35 (11.1)	17 (14.9)	21 (13.2)	122 (12.8)
IIb	465	45 (28.0)	5 (16.1)	24 (22.9)	18 (30.0)	28 (25.9)	120 (25.8)
III†	387	44 (33.8)	10 (41.7)	32 (30.2)	19 (43.2)	44 (53.0)	149 (38.5)
IV‡	172	28 (58.3)	14 (73.7)	29 (65.9)	19 (82.6)	29 (76.3)	119 (69.2)
ER/PR status							
ER−PR−‡	760	59 (23.8)	17 (27.9)	45 (19.6)	26 (28.0)	42 (32.8)	189 (24.9)
ER+ or PR+†	765	43 (16.7)	6 (9.7)	45 (16.6)	17 (24.6)	27 (25.5)	138 (18.0)
ER+PR+*	2553	85 (11.4)	23 (13.1)	47 (5.1)	36 (13.5)	68 (15.3)	259 (10.1)

* $P<.001$; † $P<.01$; ‡ $P<.05$.

53.0% of Native Hawaiian women were dead from breast cancer within five years of diagnosis, compared to 30.2% Japanese women ($\chi^2=22.2$, $P=.01$). Even among ER+PR+ women, who should have had the most favorable prognosis, significant differences were found in survival, with 15.3% of Native Hawaiian women dead within five years of diagnosis, compared to 5.1% of Japanese women ($\chi^2=87.3$, $P<.001$).

Multivariate Analysis of Survival

Cox regression modeling was used to determine the effect of ethnicity and other covariates on survival, and HRs and 95% CIs are shown in Table 4 for two different causes of death—death from breast cancer and death from another cause. For each cause of death, we examined the effect of ethnicity alone (models 1a and 2a) and the effect of ethnicity with covariates, including age, TNM stage, and ER/PR status (models 1b and 2b).

The effect of ethnicity on death from breast cancer is shown in model 1a, and findings suggest that, compared to Caucasians, the risk of death was significantly lower in Japanese and significantly higher in Filipinos and Native Hawaiians. Estimates were recalculated with age at diagnosis, TNM, and ER/PR status added (model 1b). In the full model, age at diagnosis was not significant. As expected, however, more advanced TNM stage at diagnosis increased the risk of dying. Compared to women with TNM I breast cancer, risk of death was 3.6 times greater for women with TNM IIa breast cancer, increasing to 58.2 times greater for women with TNM IV. Having a tumor that was positive for hormone receptors decreased risk of death: compared to women with ER−PR− tumors, women with ER+ or PR+ tumors had a 35% lower risk of death, while women with ER+PR+ tumors had a 63% lower risk of death. Despite the large effects of TNM and ER/PR status, however, the same ethnic pattern was seen after covariates were added, ie, risk of death was decreased for Japanese women (HR=.77, 95% CI=.64–.94), and risk of death was increased for Filipino women (HR=1.37, 95% CI=1.10–1.72) and Native Hawaiian women (HR=1.52, 95% CI=1.24–1.85). Ethnic-specific survival estimates for death from breast cancer during five years after diagnosis are shown in Figure 1; Figure 1a shows the effects of ethnicity without covariates, and Figure 1b shows the effects of ethnicity with covariates. Resulting estimates suggest five-year breast cancer survival of women diagnosed in the 1990s ranged from .92 for Filipinos and .93 for Native Hawaiians to .97 for Japanese, after controlling for age at diagnosis, TNM stage, and ER/PR status.

The effect of ethnicity on dying from a cause other than breast cancer is shown in model 2a. Compared to Caucasians, women who were Chinese, Japanese, or Filipino had a lower risk of death, while the risk of death for Native Hawaiians was similar to that of Caucasians. As expected when covariates were added (model 2b), age at diagnosis was significant, with risk of death increasing with age. The TNM score was also significant, but the association between TNM and risk of death was not as strong for women who died from another cause compared to women who died of breast cancer. Not surprisingly,

Table 4. Risk of death from breast cancer and death from other causes for women diagnosed with invasive breast cancer in Hawaii, 1990–2002, *N*=7,722: hazard ratios and 95% confidence intervals for ethnicity alone and with age, TNM, and ER/PR status§

	Death from breast cancer (*N*=752)		Death from other cause (*N*=789)	
	Model 1a HR (95% CI)	Model 1b HR (95% CI)	Model 2a HR (95% CI)	Model 2b HR (95% CI)
Ethnicity				
Caucasian	1.00	1.00	1.00	1.00
Chinese	.98 (.73–1.32)	.91 (.68–1.21)	.61 (.44–.84)†	.53 (.39–.73)*
Japanese	.61 (.50–.74)*	.77 (.64–.94)‡	.57 (.48–.68)*	.52 (.44–.62)*
Filipino	1.35 (1.08–1.70)†	1.37 (1.10–1.72)†	.61 (.46–.80)*	.90 (.68–1.19)
Hawaiian	1.46 (1.15–1.70)*	1.52 (1.24–1.85)*	1.31 (.94–1.37)	1.44 (1.19–1.74)*
Age at diagnosis		1.0 (.99–1.01)		1.08 (1.08–1.09)*
TNM stage				
I		1.00		1.00
IIa		3.61 (2.77–4.70)*		1.31 (1.10–1.57)†
IIb		8.04 (6.17–10.47)*		1.65 (1.32–2.08)*
III		14.78 (11.43–19.11)*		1.98 (1.58–2.50)*
IV		58.18 (44.93–75.34)*		4.65 (3.40–6.38)*
ER/PR status				
ER−PR−		1.00		1.00
ER+ or PR+		.65 (.53–.79)*		.84 (.66–1.07)
ER+PR+		.37 (.32–.44)*		.90 (.74–1.09)

* $P<.001$; † $P<.01$; ‡ $P<.05$.

§ Model 1 examines death from breast cancer: 1a shows the effect of ethnicity alone and 1b shows the effect of ethnicity with covariates, including age, TNM stage, and ER/PR status. Model 2 examines death from causes other than breast cancer: 2a shows the effect of ethnicity alone and 2b shows the effect of ethnicity with covariates.

ER/PR status had no effect on risk of death from a cause other than breast cancer. Risk of death was associated with ethnicity after covariates were entered, with Native Hawaiians at greater risk (HR=1.44, 95% CI=1.19–1.74) and Japanese and Chinese at lower risk (HR=.53, 95% CI=.39–.73 and HR=.52, 95% CI=.44–.62, respectively) than Caucasian women. Ethnic-specific survival estimates for death from other causes are shown in Figure 2; Figure 2a shows the effects of ethnicity without covariates, and Figure 2b shows the effects of ethnicity with covariates.

DISCUSSION

The study yielded several important findings. First, as in other parts of the United States, more Hawaii women diagnosed with breast cancer in the 1990s appear to be surviving the disease when compared to similar Hawaii-based studies of women diagnosed during the 1980s.[1,2] Second, even though survival is improving for all groups, ethnic differences remain. Japanese women diagnosed with breast cancer have a significantly lower risk of death than women in all other ethnic groups in Hawaii, while Native Hawaiian and Filipino women have a significantly greater risk of death. This pattern mirrors that found in the analysis of women diagnosed in the 1980s by Meng et al, even though those investigators controlled for additional variables (eg, marital and menopausal status and geographic residence, along with age and stage).[2,3] It also concurs with our prior analysis of survival among 4583 women diagnosed from 1990 to 1997 with breast cancer at TNM stages 0 through IV that controlled for age at diagnosis, TNM stage, and ER/PR status.[11] A somewhat different pattern was seen for other causes of death: Japanese women still had the highest rates of survival, but the lowest rates of survival were seen among Native Hawaiians and Caucasians (rather than Native Hawaiians and Filipinos). This finding concurs with a study of life expectancy based on 1990 census data in Hawaii that found that Japanese and Chinese had the longest life expectancy, followed by Filipinos, Caucasians, and Native Hawaiians.[14]

Third, we confirmed that ER/PR status was associated with breast cancer survival, in that women with ER+ and/or PR+ tumors more likely to survive five years after diagnosis than women with ER−PR− tumors. We also found that the proportion of women with ER+PR+ tumors differed by ethnicity, and that all four of the minority groups in this study—Chinese, Japanese, Filipinos, and Native Hawaiians—had greater proportions of ER+PR+ tumors than did Caucasians in this study. In fact, Native Hawaiian women in the study had the highest proportion of ER+PR+ tumors (70.1%) and Japanese women had the second highest (68.1%), compared to only 62.7% of Caucasian women. Despite this, esti-

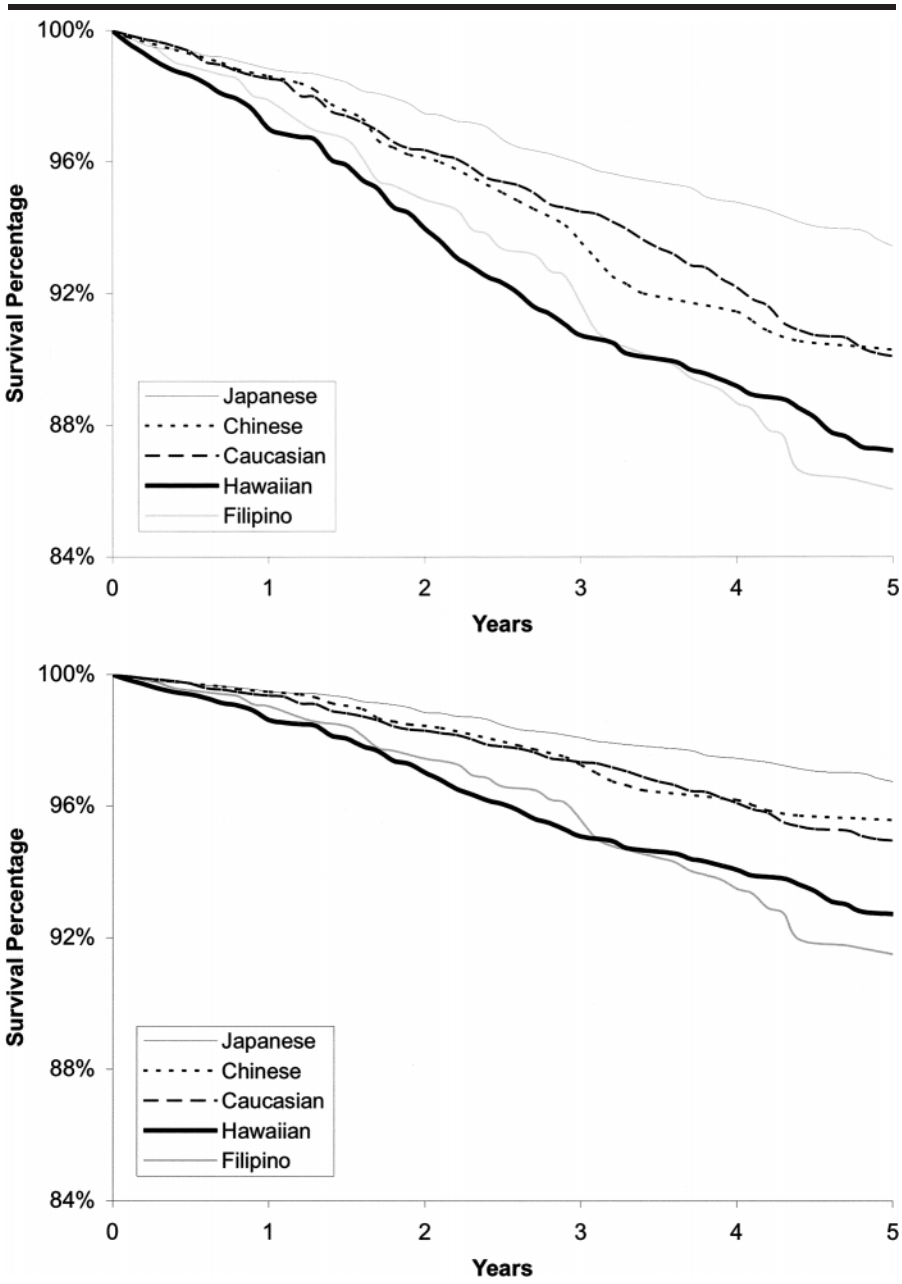

Fig 1a. Breast cancer survival by ethnicity (the order of ethnicities in legend reflects the order of survival lines at year 5)

Fig 1b. Breast cancer survival by ethnicity, controlling for age at diagnosis, TNM stage at diagnosis, and ER/PR status (the order of ethnicities in legend reflects the order of survival lines at year 5)

mated survival was still lowest among Native Hawaiian women and highest among Japanese women. In an analysis of 112,588 breast cancer cases from 11 SEER sites that included women in eight ethnic groups, Chu et al found different age and stage patterns by ER/PR status across ethnic groups. These findings support the notion that within ethnic groups, ER/PR status may further divide breast cancer patients into two or more subgroups with unique tumor characteristics.[5] Thus, further investigation into the significance of ER/PR status for each ethnic group is warranted.

Other factors that were not examined in our study likely affect breast cancer survival; these factors include comorbidity, socioeconomic status, and treatment adherence. For example, individuals with more severe levels of comorbidity have worse survival, both directly and indirectly, as severe comorbidities reduce options for treatment and the ability to tolerate treatment.[15,16] Cross-ethnic comparisons of health status in Hawaii have demonstrated relatively high rates of obesity, heart disease, diabetes, and lung disease among Native Hawaiians; these data also show that Japanese residents have the best health status and longest life expectancy in the state.[14,17] This finding suggests that studying Japanese Americans may provide clues for improving the health status of all US residents, and investigators in Hawaii may want to use Japanese Americans, rather than Caucasians, as the reference group. It also supports efforts to include comorbidities in the SEER dataset.

Socioeconomic status (SES) likely affects breast cancer survival, and Native Hawaiians have the highest rates of underemployment and underinsurance.[18] Although our study did not include these variables, Maskarinec et al attempted to do so by merging SEER data with data from health insurance claims for Hawaii breast cancer patients diagnosed between 1995 and 1998. They found that, for 1052 women with health insurance, ethnic differences in survival were not statistically different after controlling for TNM stage.[19] Other investigators have made similar findings and have used them to call for equal quality health care for all Americans.[20–23] On the other hand, two separate studies of military populations found that, despite equal access to cancer screening and treatment services through Department of Defense facilities, African-American women with breast cancer still had lower rates of five-

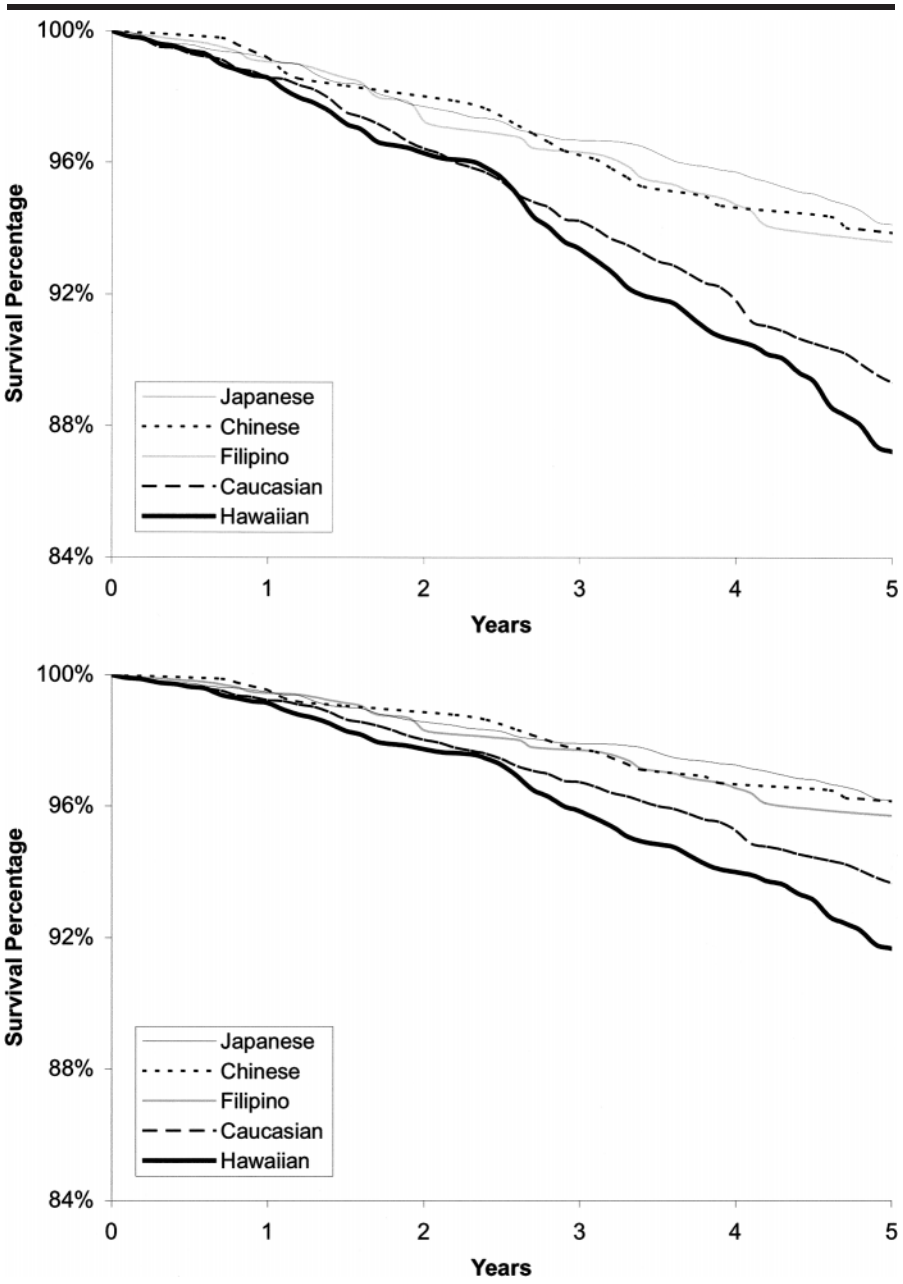

Fig 2a. Survival (cause of death other than breast cancer) by ethnicity (the order of ethnicities in legend reflects the order of survival lines at year 5)

Fig 2b. Survival (cause of death other than breast cancer) by ethnicity, controlling for age at diagnosis, TNM stage at diagnosis, and ER/PR status (the order of ethnicities in legend reflects the order of survival lines at year 5)

year survival than Caucasian women, even after controlling for known prognostic factors (including, in one study, family history, tobacco/alcohol use, and waiting time between diagnosis and treatment).[23,24]

Looking specifically at cancer treatment in Hawaii, analyses of SEER data have found that few differences exist among ethnic groups in prescribed treatment regimes,[15,19] but further studies are needed to fully examine patient compliance with recommended treatment, and these studies may need to gather data through review of medical records and claims, rather than relying on SEER registry data. In fact, a recent chart review-based analysis of compliance with National Cancer Institute Physician Data Query (PDQ) guidelines for management of early breast cancer was conducted in 406 Hawaii women. Results indicated no statistically significant ethnic differences in PDQ compliance. However, significantly fewer grade 3 and 4 chemotherapy-related toxicity reports were found in Native Hawaiians and Chinese, and reasons for this are the subject of continued study.[25]

Japanese women diagnosed with breast cancer have a significantly lower risk of death than women in all other ethnic groups in Hawaii, while Native Hawaiian and Filipino women have a significantly greater risk of death.

Finally, some investigators feel that tumor aggressiveness may differ by ethnicity and that research on the biological aggressiveness of tumors is warranted, especially when considering evidence of younger age and later stage at diagnosis and worse survival within age and stage strata for minority women compared to Caucasian women.[11,26–28] Researchers are investigating the prognostic value of various biomarkers of gene expression,[29–32] and advances in tumor microarray analysis technology promise to speed discoveries in this area.

SUMMARY

Future studies should continue to examine factors associated with better

survival of Japanese women and worse survival of Native Hawaiian and Filipino women diagnosed with breast cancer in Hawaii, including socioeconomic status, comorbidities, treatment appropriateness and compliance, and genetic markers of tumor aggressiveness.

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