Female Breast Cancer Trends in Disaggregated Asian American Populations: Analysis of 2003-2017 U.S. Mortality Data

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Abstract

Purpose

Breast cancer is the second leading cause of female cancer mortality in the United States and breast cancer mortality in Asian Americans (AA) is rising by 1.5% per year. However, aggregated AA breast cancer death rates may mask important mortality differences in major AA groups.

Population & Setting

11,388 AA and 473,927 non-Hispanic White (NHW) females based on the United States Centers for Disease Control and Prevention National Vital Statistics System database 2003-2017.

Methods

Age-adjusted mortality rates (AAMR) were used to estimate trends in breast cancer mortality in Asian Indians, Chinese, Filipinas, Japanese, Koreans, Vietnamese, and non-Hispanic Whites from 2003–2017, with attention to annual percentage change (APC) and proportional mortality rates (PMR).

Results

From 2003-2017, breast cancer deaths comprised 14.4% in NHWs, 13.7% in aggregate AAs, 19.8% in Asian Indians, and 18.6% of all cancer deaths in Filipinas. While NHW breast cancer mortality rate significantly decreased (APC -2.1; CI -2.6, -1.6; $p < 0.001$) from 2003 to 2017, aggregate AA mortality rates were unchanged (APC 3.07; CI -0.37, 7.8; $p = 0.071$). However, when disaggregated, breast cancer mortality in Filipina (APC 1.9; CI 0.8, 3.0; $p < 0.002$), Chinese (APC 2.1; CI 1.3, 3.0; $p < 0.001$), and Korean (APC 2.6; CI 1.0, 4.1; $p = 0.004$) women significantly increased. Breast cancer mortality rates in Japanese women decreased (APC -1.9; CI -5.9, 2.1; $p = 0.3$).

Conclusion

While the proportion of women dying from breast cancer were similar in NHWs and aggregate Asians, when disaggregated, Filipina, Korean, and Chinese women had increased mortality rates over the past 15 years. During this time, breast cancer mortality in NHW and Japanese women decreased. Understanding disaggregated breast cancer mortality rates in Asians may improve culturally-tailored outreach, prevention, and treatment strategies to reduce cancer deaths from this critical disease.

Introduction

In the United States, 1 in 8 women (12%) will be diagnosed with invasive breast cancer in their lifetime and 1 in 39 women (3%) will die due to breast cancer¹. Efforts such as emerging treatments and more aggressive screening practices have significantly reduced breast cancer mortality by 40% from 1989 to

2017¹. Despite this progress, breast cancer is still predicted to be the leading form of new cancer diagnosed in 2020 and will account for 30% of all predicted cancer cases in all American females².

When aggregated, women with Asian/Pacific Islander ancestry appear to have the lowest breast cancer incidence (93.7 per 100,000) and death (14 per 100,000) rates of all American racial groups¹, but the aggregate Asian American (AA) breast cancer incidence has been increasing by 1.5% yearly^{3,4}. With over 17.3 million AAs in the U.S. in 2010, this rate of increase in breast cancer indicates a significant healthcare burden^{5,6}.

The distinct ethnic subgroups comprising the AA population are extremely diverse in country of origin, length of US residence, acculturation, socioeconomic status, language, culture, religion, and more⁷⁻¹⁰. By aggregating all AAs into a single group, health care providers and policy makers may miss critical heterogeneity around breast cancer healthcare and mortality¹¹. For example, Thompson et al. examined disaggregated death certificate data of AAs (Asian Indian, Korean, Japanese, Chinese, Vietnamese, and Filipino) from 2003 to 2011 and found that female Filipino Americans had the highest comparative rates of breast cancer amongst the six AA ethnic groups, even if the aggregated AA death rates trended downward¹². However, this study did not find any significant breast cancer mortality trends for any of the AA groups.

In this study, we present updated trends in female breast cancer mortality rates from 2012 to 2017 among six disaggregated AA ethnicities in comparison with Non-Hispanic White (NHW) females using the Centers for Disease Control and Prevention (CDC) National Vital Statistics System (NVSS) mortality dataset. We also compare current breast cancer mortality trends to previous trends from 2003 to 2011.

Methods

Data

U.S. mortality records between 2003 to 2017 for all fifty states were obtained under an IRB data-use agreement from the CDC NVSS mortality dataset (Protocol # 53429). Death certificates were completed by clinicians and/or medical coroners at time of death and include information about age, sex, race/ethnicity, and cause of death. Underlying causes of death were classified by the International Classification of Diseases (ICD), 10th revision. ICD-10 code C50 (malignant neoplasm of the breast) identified breast cancer as the primary underlying cause of death. Other variables of interest included sex and age.

Participants

Female NHWs and AAs within six ethnic groups were included: Asian Indians, Chinese, Filipinos, Japanese, Koreans, Vietnamese. Hispanics, African American or Black, Pacific Islanders, and any AAs not in the six selected subgroups were excluded. Males were also excluded from the study. Incomplete death certificates (decedents with missing data for age and primary cause of death variables) and individuals

with mixed racial identity or unknown age were excluded. Data analysis was conducted for 473,927 NHW females and 11,388 AA females (1425 Asian Indians, 2898 Chinese, 3865 Filipina, 1549 Japanese, 949 Korean, 702 Vietnamese) (Fig. 1).

Statistical Analysis

Three different numerical measures were calculated: age-adjusted mortality rates (AAMR), standardized mortality ratios (SMR), and proportionate mortality. AAMR was calculated as the deaths per 100,000 people. Annual percentage change (APC) was calculated as the average percentage change in the fifteen-year period. SMR was calculated as a ratio of the AAMRs with NHW as the reference. Proportionate mortality was calculated as the proportion of breast cancer deaths compared to all cancer deaths. Population counts were extrapolated based on the 2003 and 2010 US Census. To account for the rolling adoption of the 2003 death certificate by state, population adjustment was conducted by enrolling descendants from each state as disaggregated information became available¹³. Death and population data from each state were included in the numerator and denominator, respectively, when that state adopted the 2003 death certificate. For AAMRs from 2003–2017, age adjustment was calculated using the 2010 US standard age distribution of the population. The same standard age distribution was applied to each group's age-specific mortality rates in order to compare groups. Nativity population data for each of the six AA subgroups was gathered from the American Community Survey (ACS)¹⁴. We did not suppress data with < 10 deaths per cell. A linear model, and not a joinpoint analysis, to analyze the overall trend.

Results

Results for Aggregate AAs

We identified 624,221 female AA decedents and 30,269,449 female NHW decedents over the fifteen-year study period, of whom 612,833 female AAs and 30,222,057 female NHWs were excluded and 11,388 female AAs and 473,927 female NHWs died of breast cancer (Supplementary Fig. 1). Overall, 13.7% of aggregate female AA and 14.4% female NHW cancer deaths were from breast cancer. AAMRs within disaggregated female AAs ranged from 3.5 per 100,000 (Vietnamese) to 21.6 per 100,000 (Filipina) (Fig. 2 and Supplementary Fig. 2).

Results for Disaggregated AAs

Breast cancer death rates over time: Temporal AAMR rates demonstrated a significant decrease in NHW breast cancer mortality (APC - 2.11; CI -2.63 -1.60; $p < 0.001$) while breast cancer mortality in aggregate AAs was increasing, but not significantly (APC 3.07; CI -0.37 6.50; $p < 0.05$) (Fig. 2 and Supplementary Fig. 2). However, when AAs were disaggregated, Filipinas consistently had the highest AAMR rates, while Japanese women had the lowest rates (Fig. 2 and Supplementary Fig. 2). In addition, Filipinas had a significantly increasing trend (APC 1.75; CI 0.98 2.53; $p < 0.001$), as did Chinese (APC 2.00; CI 1.06 2.92; $p < 0.001$) and Korean (APC 1.98; CI 0.58 3.36, $p < 0.01$) women. Japanese women had an

insignificant decreasing breast cancer mortality trend (APC = 1.88; CI -5.88 2.1, $p = 0.33$). Asian Indians (APC = 0.06; CI -2.25 2.37; $p = 0.96$) and Vietnamese women (APC 1.72; CI -0.01 3.45; $p = 0.05$) had stable breast cancer mortality rates with no significant trends.

Proportion of breast cancer deaths: Although proportionate mortality of breast cancer deaths compared to all cancer deaths for aggregate AAs (13.7%) and NHWs (14.4%) appear comparable, the disaggregated AA ethnicities show great variability (Fig. 4). Asian Indians (19.8%) and Filipinas (18.6%) had the highest proportion of breast cancer deaths, as well as NHWs (14.4%). On the other end, Korean (10.0%), Japanese (10.7%), and Vietnamese women (10.5%) had the lowest proportion of breast cancer mortality.

Nativity Analysis

An analysis of breast cancer mortality trends from 2003–2017 for each of the six Asian groups showed no significant differences by place of birth, except for Japanese women (Fig. 5). US-born Japanese women had decreasing rates of breast cancer deaths (APC = 1.0; CI -1.7 -2.4; $p = 0.0001$), while breast cancer deaths increased in foreign-born Japanese (APC 11.4; CI 0.8 6.12; $p = 0.02$) (Fig. 6 and Supplementary Fig. 3).

Discussion

Over the past 15 years, we found that non-Hispanic white women have exhibited steadily decreasing breast cancer mortality trends (about 2.1% annually), while the aggregate Asian Americans breast cancer deaths have remained stable. However, when AAs groups are disaggregated, they demonstrate considerable heterogeneity. Specifically, we found that Filipina, Korean and Chinese women have about a 2% annual increase in breast cancer deaths. Moreover, Filipina women had the highest age-adjusted breast cancer rates which were about two times higher than aggregate AAs. By contrast, Vietnamese, Asian Indians, and aggregated AAs exhibited a stable breast cancer mortality trend. While aggregated proportions of cancer deaths were the same for NHW and AA (about 14%), when disaggregated, AA groups demonstrated broad variability in mortality. The large variability in breast cancer mortality rates by AA groups corresponds to results from earlier studies. Thompson et al., found that Filipinas had the highest rate of breast cancer, contributing to 19.5% of all Filipina cancer deaths¹². They also found 19.8% of all Asian Indian cancer deaths were from breast cancer, now the leading cause of all Asian Indian cancer deaths. These findings might be influenced by cancer type, hormone therapy, access to care, screening and lifestyle behaviors amongst women within each AA group.

High but stable breast cancer mortality in Asian Indian women and low but stable mortality in Vietnamese women may be influenced by cancer type. Asian Indians are more likely than NHWs to have triple-negative breast cancer^{15–17}, which is relatively uncommon and, until recently, without curative targeted therapies^{18–19}. Conversely, Vietnamese women are more likely to have HER2-positive breast cancer²⁰, which can have a poor prognosis if not treated optimally with targeted therapies²¹. The stable breast cancer mortality among Asian Indian and Vietnamese women may also be influenced by access to

care²². Increasing AA breast cancer mortality may be driven by post-menopausal hormone replacement therapy (HRT)²³. Breast cancer risk increased 26% per 5 years of current use of estrogen and progestin therapy ($p = 0.017$) in a study of 1,277 Chinese, Japanese, and Filipinas²⁴. Asian and Pacific Islander postmenopausal women may be at higher risk for developing breast cancer (OR 1.58; 95% CI of 1.18–2.11) than NHW women (OR 1.21; 95% CI 1.14–1.28) after using HRT²⁵.

Increasing breast cancer mortality in Filipina, Chinese, and Korean women may be due to lack of preventative public health measures, including screening^{26–28} and treatment²⁹. AA cancer screening rates are lower than those of NHWs for all cancer types³⁰ and AA women (65%) tend to have lower breast cancer screening rates than NHWs (68%)³¹. In a study comparing mammography rates among AA subgroups, South Asian and Korean women had the lowest mammography rates while Japanese women had the highest rates, second only to NHW women⁷. By contrast, Korean American women had the lowest rates of breast cancer screening³². Acculturation, healthcare access, and low levels of health literacy have been posited as potential reasons for reduced breast cancer screening in AAs^{30,33–35}. Breast cancer screening rates also vary between the AA subgroups²⁶.

Lower levels of screening, perhaps coupled with an increase in risk factors associated with a Western lifestyle (e.g., obesity, alcohol, tobacco, unopposed continuous estrogen from reduced and/or delayed parity) may contribute to increasing breast cancer mortality trends within Korean women. In addition, screening behaviors vary by Asian American group. A meta-analysis found that only 34–65% of Korean women aged 50–74 reported obtaining a mammogram within the last two years, compared to 73% of white women and 72% of other Asian women³⁶. Mammography screening among Korean American women in the past two decades has also significantly increased, but these rates are still much lower than NHWs, especially since Korean American women tended to be uninsured and sought out professionals from South Korea where preventative health measures are unusual²⁶. Consistent with their lower utilization of mammography screening, Korean women were twice as likely to be diagnosed with a tumor size > 1 cm as compared to White women (OR 2.38; CI 1.49 3.80)³⁷.

Amongst Asians, Japanese women had the lowest rates of breast cancer mortality. Not only have Japanese American women been shown to have increased mammography rates compared to other Asians³⁸, Japanese American women with breast cancer also had a lower risk of having advanced-stage disease than NHW women or those in other Asian subgroups³⁹. Increased adoption of breast screening among Japanese may be driven by a larger proportion of acculturated, highly educated, and wealthier Japanese American women as compared by other AA ethnicities^{8,40}.

Our study has several limitations. While we captured all deaths in the United States, ethnic/racial groups may have been misclassified unintentionally by the healthcare provider or funeral director completing the death certificate, especially if next-of-kin or family members were not present⁴¹. However, ethnicity misclassification has been diminishing over time, and are estimated at 3% for Asian Pacific Islanders⁴¹. States' adoption of the 2003 death certificate Asian subgroup classification occurred over time, although

the states with the largest Asian populations were among the earlier adopters¹³. Finally, as death certificate data are not linked to other medical information, no information is available about other socioeconomic data that might inform further mortality-related analysis.

Conclusion

Breast cancer mortality may be improved with healthy lifestyles, early diagnosis via mammographic screening, tailored treatment, and ongoing follow-up. The high and often increasing rates of breast cancer mortality among specific Asian American groups point to the need to disaggregate AA subgroups during research studies, to ensure that potential disparities in access to effective screening, treatment and follow-up care do not go unnoticed and unresolved.

Declarations

Funding

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Conflicts of Interest

The authors have no conflicts of interest to declare that are relevant to the content of this article.

Availability of Data and Material

The datasets generated during and/or analysed during the current study are available from the corresponding author on reasonable request

Code Availability

R Studio, Version 3.6.1

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Figures

	Non-Hispanic White	Aggregate Asian	Asian Indian	Chinese	Filipino	Japanese	Korean	Vietnamese
Count	473927	11388	1425	2898	3865	1549	949	702
Native born	NA	1624	39	354	259	923	33	16
Foreign born	NA	9764	1386	2544	1386	626	916	686
Age >1 - 19	6	0	0	0	0	0	0	0
Age 20-29	588	27	2	11	8	0	2	4
Age 30-39	8404	406	97	85	125	14	46	39
Age 40-49	34890	1591	219	442	536	105	154	135
Age 50-59	79702	2937	327	798	1054	258	289	211
Age 60-69	104501	2733	377	611	1079	282	227	157
Age 70-79	104973	1960	246	445	674	358	140	97
Age 80-99+	140856	1730	157	503	389	5310	910	59

Figure 1

Demographics of Asian American and non-Hispanic white female breast cancer decedents, National Vital Statistics System 2003-2017

Figure 2

Age-adjusted breast cancer mortality rates per 100,000 reported by Asian American group and non-Hispanic whites female breast cancer decedents, National Vital Statistics System 2003-2017

Figure 3

Age-adjusted mortality ratio standardized by the age-adjusted mortality rate for Asian American and non-Hispanic Whites female breast cancer decedents, National Vital Statistics System 2003-2017, reference group American Community Survey 2010

Figure 4

Proportionate mortality of breast cancer compared to all cancer mortality in Asian American and non-Hispanic white women, National Vital Statistics System 2003-2017

Figure 5

Total breast cancer deaths amongst Asian American groups, by nativity (US vs Foreign-born), National Vital Statistics System 2003-2017

Figure 6

Breast cancer age-adjusted mortality rates per 100,000 for Asian American female decedents, by nativity (US-born vs foreign-born), National Vital Statistics System 2003-2017

Supplementary Files

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