CANCER PREVENTION INSTITUTE OF CALIFORNIA
Preventing Cancer. Promoting Life.

Recent trends in breast cancer incidence and mortality in Marin County, California, 1988-2012

An Update from the Greater Bay Area Cancer Registry
September 21, 2015

Christina A. Clarke, Ph.D., Meg McKinley, M.P.H., Sally L. Glaser, Ph.D.
Cancer Prevention Institute of California and Stanford Cancer Institute
Correspondence: tina@cpic.org

Executive summary:

As part of our regular surveillance of cancer in the nine-county Greater Bay Area region of California, the Greater Bay Area Cancer Registry has carefully assessed recent trends in breast cancer incidence in the non-Hispanic white female population of Marin County, a population for whom elevated rates had been reported in the past. Our review of the most complete incidence data (1988-2012) and mortality data (1988-2013) available, finds:

1) The burden of breast cancer in Marin County is lower now than in prior years, with the most recent incidence rate of 130 cases per 100,000 being the lowest reported since 1988, and 31% lower than the highest rate, which was reported in 2001.

2) Breast cancer mortality rates continue to decline in Marin County as elsewhere. The most recent mortality rate is 16 deaths per 100,000 women. This rate was 65% lower than the rate in 1988.

3) Breast cancer rates among non-Hispanic white women in Marin County have been comparable to those for similar populations in other geographic regions of California since the mid- to late- 2000's.

4) It does not seem likely that possible changes in mammography are responsible for the current patterns of breast cancer incidence.

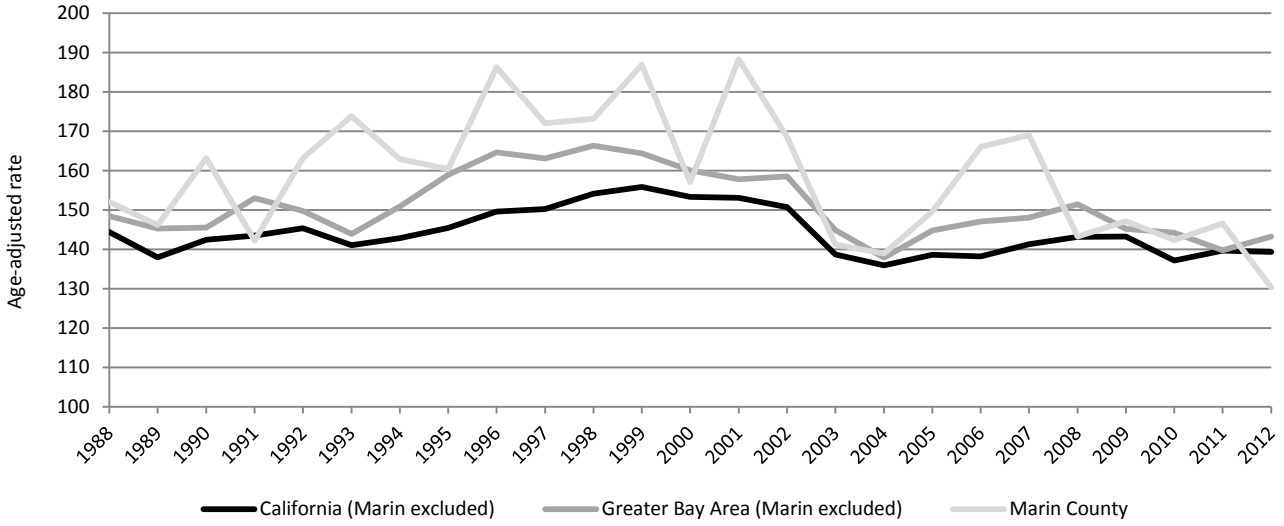
5) Rates of breast cancer for most other racial/ethnic groups in Marin County are currently comparable to those for non-Hispanic white women.

FINDINGS

As part of our regular surveillance of cancer in the nine-county Greater Bay Area region of California, the Greater Bay Area Cancer Registry has carefully assessed recent trends in breast cancer incidence in the non-Hispanic white female population of Marin County, a population for whom elevated rates had been reported in the past. We have used the most complete data available (1988-2012) to assess incidence (occurrence of new cases), and mortality (occurrence of new deaths) due to breast cancer. Below we summarize the key observations from our analyses.

The burden of breast cancer in Marin County is lower now than in prior years. The most recent single year for which data are complete (2012) shows a rate of invasive breast cancer incidence of 130 cases per 100,000 women, which is the lowest reported since 1988, when state-mandated cancer registration in California began. Figure 1 presents the annual incidence rates of invasive breast cancer in white women in Marin County since 1988, showing that while rates vary from year to year, they have a generally decreasing trend throughout the last decade. Comparing the 2012 rate to rates for prior years, we see that it is 31% lower than the highest rate of 188 cases per 100,000, which was reported in 2001.

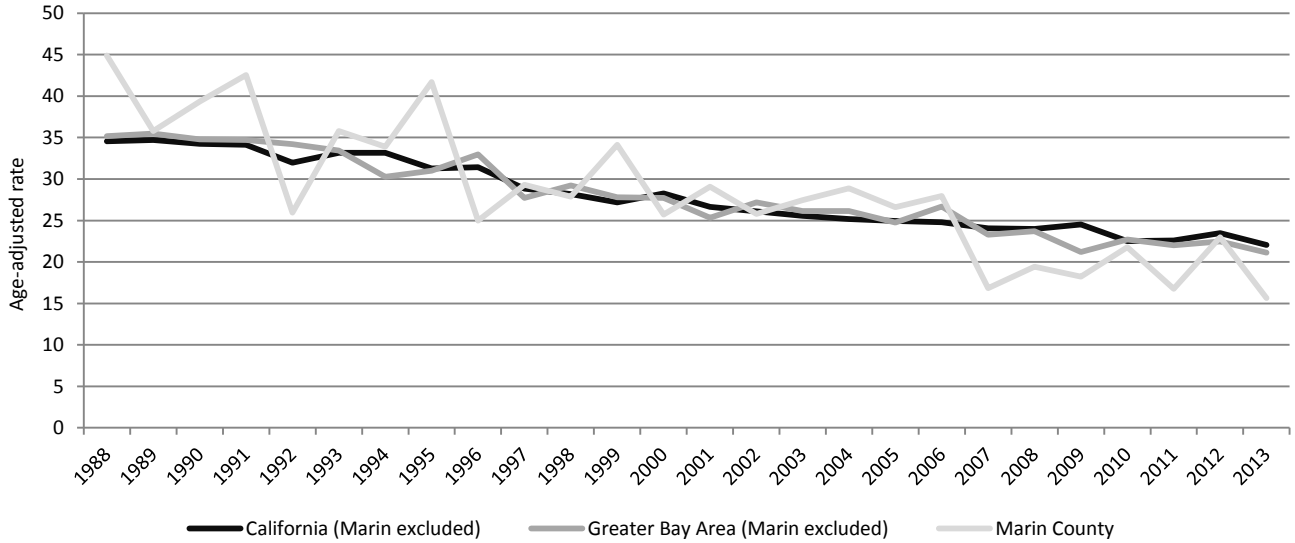
Figure 1: Invasive breast cancer incidence rates among non-Hispanic white women by California region, 1988-2012



Rates can fluctuate substantially year-to-year in this population. To assess trends over the full time period, we use a statistical method (Joinpoint regression) that detects and quantifies any major changes in trend. With this approach, we determined that from 1988 to 1998, annual incidence rates increased at a significant rate (an average of 1.8% per year (95% confidence interval (CI): 0 - 3.7)), and from 1998 to 2012, annual incidence rates declined significantly at the same pace, 1.8% per year (95% CI: -2.9, -0.8, statistically significant).

Recent breast cancer mortality rates also show substantially larger declines than reported in earlier years. The most recent year for which data are complete (2013) registered a mortality rate of 16 per 100,000 women. This rate was 65% lower than the rate in 1988, when statewide cancer registration began. Figure 2 shows yearly mortality trends in Marin County and other geographic areas. The average annual change in Marin County mortality rates during the period 1988-2013 was a statistically significant decline of 3.2% per year (95% CI: -4.0, -2.4, statistically significant).

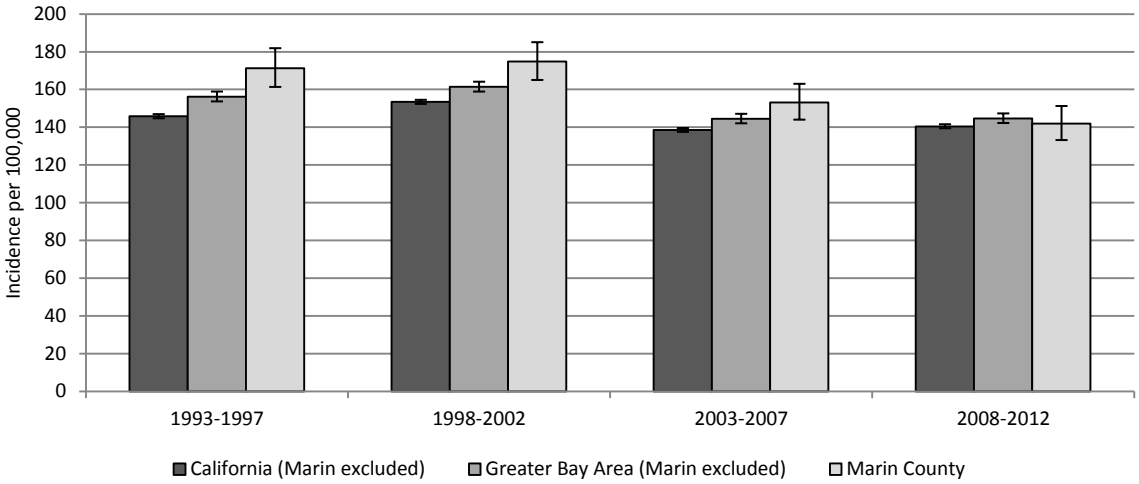
Figure 2: Breast cancer mortality among non-Hispanic white women by California region, 1988-2013



Other California regions have experienced similar declines in the breast cancer burden. The significant declines observed in breast cancer incidence and mortality in Marin are comparable to those observed in other parts of the Greater Bay Area and in the state of California (Figures 1 and 2).

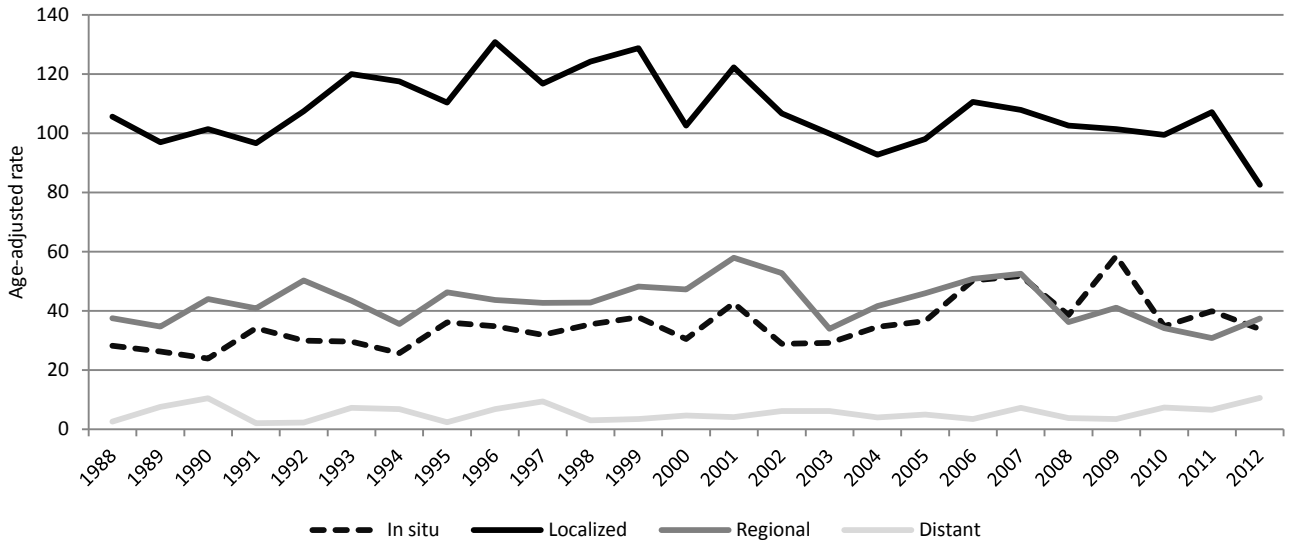
At present, there is no evidence of a geographic excess of breast cancer among non-Hispanic white women in Marin County. Figure 3 shows five-year average annual rates of invasive breast cancer at different times between 1993 and 2012. Elevated rates of breast cancer were observed in Marin County compared to other regions in the 1990s through the period 1998-2002, but then these differences started to "close up", as we reported previously. During the period 2003-2007, rates of breast cancer were no longer statistically different than those in other parts of the Greater San Francisco Bay Area, but were statistically higher than those for the state. The rates for the most recent five-year time period (2008-2012) show no statistically significant geographic differences in incidence among Marin County, the rest of the Greater San Francisco Bay Area, or the rest of the state. In other words, in the mid- to late- 2000s, rates of invasive breast cancer in the Marin County white non-Hispanic female population became comparable to rates in other geographic regions in and across California.

Figure 3: Five-year average annual invasive breast cancer incidence rates among non-Hispanic white women by California region and time period, 1993-2012



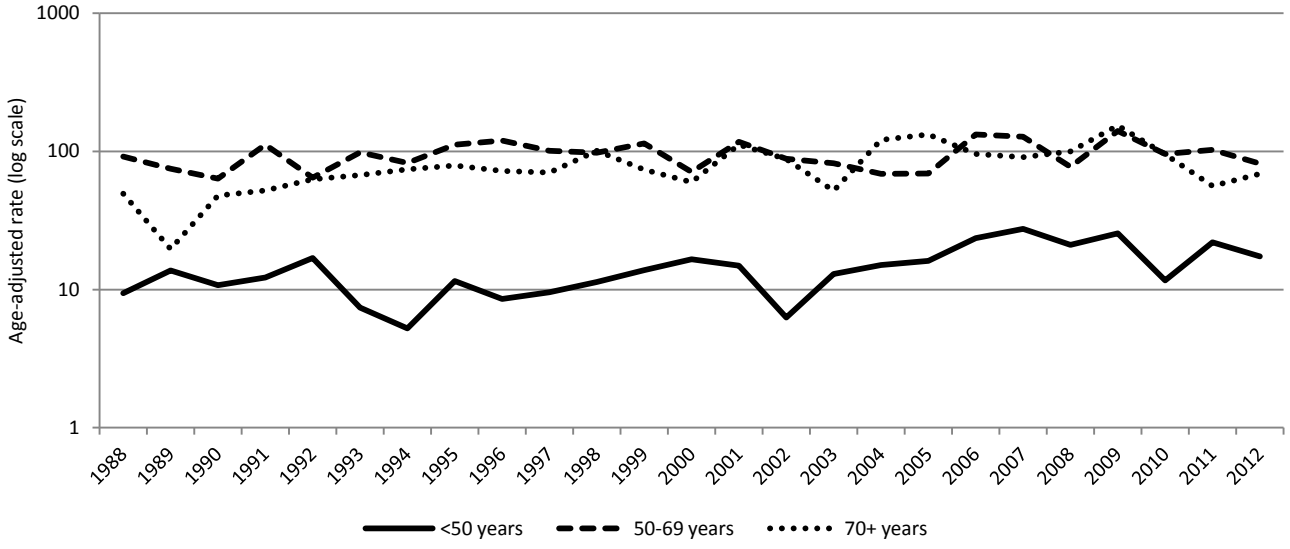
Reasons for the recent reductions in breast cancer incidence are uncertain. It has been hypothesized that recent changes in mammography recommendations could have influenced the observed patterns of recent breast cancer incidence. In 2009, the U.S. Preventive Services Task Force changed its recommendation for the use of screening mammography for breast cancer from every 1-2 years to every two years for women ages 50-74 years. Women aged 40-49 and 75 and older were not recommended to receive routine screening mammograms. One could speculate that widespread compliance with this new recommendation could affect subsequent breast cancer incidence patterns: if fewer cancers were diagnosed in a given time period because screening was less frequent, the resulting change in rates should be especially apparent by stage of diagnosis, as *in situ* cancers are primarily detected by mammography. Figure 4 presents trends in breast cancer incidence by four categories of stage at diagnosis (*in situ* (stage 0), localized, regional, and distant (metastatic)). This graph shows a steady decline in localized breast cancer rates since 1996 (by an average of 1.7% per year) and relatively stable incidence of regional and distant (metastatic) breast cancers since 1988. However, rates of in situ (stage 0) tumors have increased by an average of 2.1% per year since 1988, which is a very different pattern from the decline in *in situ* breast cancer that would be expected from a reduction in screening mammography usage. Overall, we do not think that these breast cancer rate patterns can speak to the possible influence of changing mammography rates among this population. If mammography rates are stable, and if incidence is not being affected by any other factors, rates of *in situ* and localized breast cancers should be stable and regional/distant tumors stable or declining. Thus, as the trends by stage that we have observed are not consistent with what would logically occur after reduction in mammography uptake, i.e. a reduction in *in situ* incidence, it does not seem plausible that the lower overall rates of invasive breast cancer seen in non-Hispanic women in Marin County or in other California regions in recent years are explained by reductions in mammography.

Figure 4: Annual breast cancer incidence among non-Hispanic white women by stage at diagnosis, Marin County, 1988-2012



In situ breast cancer incidence rates are stable in young women. At the request of the Marin County Health Department, we also carefully assessed *in situ* breast cancer incidence rates by age. We see that rates have been statistically stable in younger women (<50 years) over the time period assessed (Figure 5). These patterns do not support the hypothesis that mammography usage changes by age are responsible for the lower rates of invasive breast cancer observed in recent years.

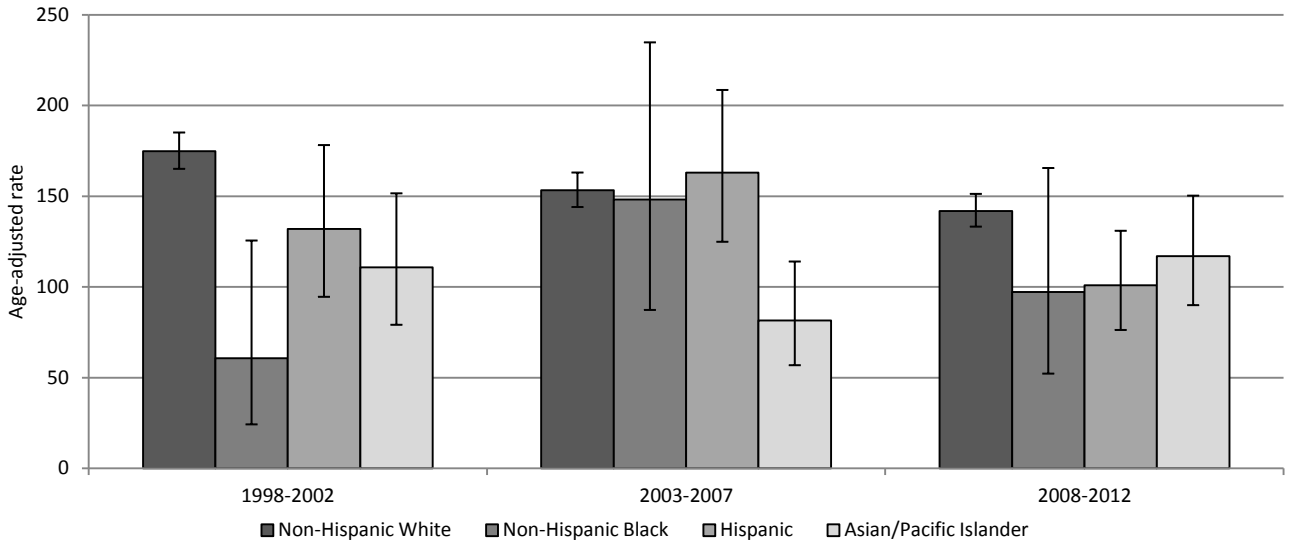
Figure 5: Annual in situ breast cancer incidence among non-Hispanic white women by age, Marin County, 1988-2012



The GBACR performs an assessment of breast cancer incidence and mortality rates and trends in all racial/ethnic groups and counties on a yearly basis. While non-Hispanic white women have been the focal point of breast cancer research in Marin County due to the higher rates they experience as well as the fact that the size other race populations is too small

to allow examination of annual rates, compared to other racial/ethnic groups, our most recent data shows that racial/ethnic differences in breast cancer rates among Marin county women are not as pronounced as in prior periods. Currently, the breast cancer incidence rates for most other racial/ethnic groups are not statistically different than the rates for non-Hispanic whites; in other words, the rate gap has "closed up" between all racial/ethnic groups. Figure 6 shows that whereas the overall invasive incidence rates for 1998-2002 were higher among non-Hispanic white women than other racial/ethnic groups, significantly for African-Americans and Asian/Pacific Islanders and non-significantly for Hispanics, these differences are not observed in more recent time periods. In the most recent five year period, breast cancer rates were statistically similar among non-Hispanic white, African-American, and Asian/Pacific Islander women in Marin County. Incidence rates among all other racial/ethnic groups have shown no statistically significant increase or decrease since 1998 (See Figure 6).

Figure 6: Five-year average annual invasive breast cancer incidence rates among Marin County women by race/ethnicity and time period, 1993-2012



DETAILED METHODOLOGY

From the state-mandated California Cancer Registry, we obtained information regarding all incident cases of breast cancer (both *in situ* and invasive) diagnosed in the period January 1, 1988 through December 31, 2012 among residents of the following geographic areas: Marin County and other counties included in the Greater Bay Area Cancer Registry (Alameda, Contra Costa, San Francisco, San Mateo, Santa Clara, Monterey, San Benito and Santa Cruz), and the rest of California. Breast cancer was defined as International Classification of Disease for Oncology, 3rd Edition [ICD-O-3], topography codes C50.0 through C50.9 and morphology codes 8000-9989, excluding 9050-9055, 9140, and 9590-9992. This report focuses on non-Hispanic white population of Marin County because of prior concerns and reports limited to this particular population. However, trends in incidence and mortality among all racial/ethnic groups were analyzed. We obtained cancer mortality data and population estimates from the National Cancer Institute SEER program through their SEER*Stat program (version 8.2.1, National Cancer Institute, Bethesda, MD). We used SEER*Stat for all calculations, including case distributions, incidence and mortality rates per 100,000 person-years, and corresponding 95% confidence intervals. We used Joinpoint regression models to identify distinct slopes in the incidence trends. Annual percentage change statistics and 95% confidence intervals generated by Joinpoint analyses were used to characterize the trends' magnitude and direction. All rates were age-adjusted to the 2000 US standard. Tests of statistical significance assumed a two-sided p-value of <0.05.