Racial/Ethnic Differences in Early Detection of Breast Cancer: A Study of 250,985 Cases from the California Cancer Registry

Courtney Summers, M.D.,^{1,2} Sidney L. Saltzstein, M.D., M.P.H.,¹ Sarah Lynn Blair, M.D.,¹ Tara Tomiko Tsukamoto, B.S.,^{1,3} and Georgia Robins Sadler, B.S.N., Ph.D.¹

Abstract

Aims: This study analyzed early breast cancer detection rates as a surrogate for breast cancer mortality rates. Stage at diagnosis was broken down by race/ethnicity and year of diagnosis for the cases of female breast cancer in the California Cancer Registry from 1988 to 2002.

Methods: A quarter million cases of breast cancer in women ≥ 50 years of age recorded in the California Cancer Registry over the period 1988–2002 were classified as early (*in situ* and localized stages) or late (regional and distant stages). The increases in the percent of cases that were early were studied by 3-year periods over this interval. In addition to the total group, data were broken down by race/ethnicity. The 3-year periods were used to compensate for small numbers of cases in some of the nonwhite groups.

Results: The proportion of early stage female breast cancers reached a plateau at 70% in the mid-1990s. African American and Hispanic women's screening rates reached a plateau at a considerably lower rate. Only Pacific Islander/Asian American women demonstrated a sustained rise in the percent of early breast cancers detected through 2002, eventually nearing the rate of early detection set by white women.

Conclusions: The plateaus observed suggest that focused interventions continue to be needed for all women, especially for African American and Hispanic women if the American Cancer Society's 2015 goals are to be achieved.

Introduction

BREAST CANCER IS THE MOST COMMON cancer among women and is second only to lung cancer as a cause of cancer-related deaths in women.^{1,2} It is widely accepted in the medical community that adherence to screening guidelines leads to the early detection of breast cancer and that, in turn, leads to decreased mortality rates.^{3–7} Although there has been an overall increase in screening and survival rates, disparities in stage of detection, treatment, and survival rates have been repeatedly demonstrated between white and nonwhite groups.^{8–18} To address these discrepancies, various intervention programs have been introduced in California with the aim of increasing breast cancer awareness, screening, and early detection, including many programs that focus on addressing the identified breast cancer disparities reported among nonwhite women.^{19–22} This study examined the proportions of early and late stage breast cancers detected across

ethnic groups living in California to determine if there has been an increase in the proportion of reported early stage cancers (and a parallel decrease in the proportion of reported late stage cancers) from 1988 to 2002 and compares these changes among ethnic groups.

Materials and Methods

State legislation made cancer a reportable disease in California since 1988. The California Cancer Registry (CCR), created in 1946 as a 10% sample of the state, became the repository for the now total population-based registry. The CCR is the total population-based registry serving the largest and probably most diverse total population in the world. New cases must be reported by physicians, health facilities, laboratories, and all others who offer care to cancer patients, with penalties for those who fail to report cases. Over the time period of this study, 10 Regional Cancer Registries acted as

¹Moore's USCD Cancer Center, USCD School of Medicine, University of California at San Diego, La Jolla, California.

²Present address: Scripps Mercy Hospital Chula Vista, La Jolla, California.

³Present address: University of California at San Francisco, San Francisco, California.

the first-level receiving facilities and were also responsible for providing quality assurance, consolidation of multiple reports for the same patient, and technical help to those who are responsible for reporting the cases. The data were then submitted to the central Registry, where further quality assurance measures were taken, along with consolidation of duplicate entries, clearance with death certificates, mutual referral of reports of patients actually residing in other states, and responses to requests to access the Registry's database. The CCR is certified by the North American Association of Central Cancer Registries (NAACCR), and currently the entire state is part of the National Cancer Institutes (NCI) Surveillance, Epidemiology, and End Results Program (SEER).

Fifteen years of data, with all patient, physician, and institutional identification removed, are available to researchers. This includes 250,985 cases of breast cancer in women from 1988 through 2002. The dataset includes demographics of the patient, such features of the tumor as stage and histology, and some follow-up information. How the cancer was detected (breast self-examination, physicians' examination, mammography) is not included in the CCR data. In order to correspond with screening recommendations, especially in the early part of this study, only women ≥ 50 years of age were included in the study. Coincidentally our selection of patients age 50 years or older fits the recent recommendation of the US Preventive Services Task Force. Survival studies were not performed because the follow-up interval would have been too short (<10 years) to be meaningful for all except the earliest time period and part of the second time period. Even 10-year figures are probably worthless for breast cancer.²³ After the first 3–5 years, the long-term survival falls at a constant rate for at least 25 years in women with breast cancer (S.L. Saltzstein, unpublished observations, 2009).

Statistical analyses

EpiInfo 6 (Center for Disease Control and Prevention) was used to perform the analyses presented in this article. Simple

ratios of early/late cases were calculated. Chi-square values were obtained in the usual manner. The original intention of the data analysis presented in this article was to compare San Diego County data with the rest of California. However, when the data were broken down into these two categories and then by race/ethnicity categories, year of diagnosis, and stage, there were not enough cases in many cells to give significant results. To achieve large enough numbers in each of the cells, therefore, the tabulations of the data were done for 3-year periods, and the data for non-Hispanic white women were contrasted with the data for all others (black, Hispanic, and Asian/Pacific Islander). The data presented are for the entire state of California.

The stage in the CCR is the one that is made by the original medical management team and is not changed subsequently (except to correct errors). For this analysis, the simpler Registry staging was used (*in situ*, localized, regional, and distant) because 18% of the cases, especially those from the first several years, do not have TNM staging data. Ninety-three percent of cases have this simpler staging information. For breast, as for other sites, the various stages are rigorously defined. For this study, early stage includes *in situ* and localized cancers and corresponds quite well with T₁ (<2 cm), N₀ (nodes negative), M₀ (no metastasis) cancers; regional and distant tumors are considered late stage. We chose to use percentages of early and late cancer rather than incidence rates of the two because percentages will show the time and ethnic effects in a simpler manner. Incidence rates have been published by the California Division of the American Cancer Society (ACS), but only the early stage figures are provided.²⁴

Results

Statewide, between 1988 and 1994, there has been a consistent increase in the proportion of breast cancers diagnosed in the early stage in all ethnic groups combined (Fig. 1). Since 1994, the proportion of breast cancers diagnosed in the early stage has reached a uniform plateau, or even a slight drop, for

FIG. 1. Early breast cancer detection rates: all women in California (aged ≥ 50), 1988–2002.

FIG. 2. Early breast cancer detection rates: by ethnicity in California (aged ≥ 50), 1988–2002.

all ethnic groups. However, it appears that although all ethnic groups reached this plateau at the same time (1994–1996), the plateau occurred at a lower percentage among nonwhite groups than white women (Fig. 2). Early breast cancer detection rates remained far lower among African American and Hispanic women than among non-Hispanic whites and Pacific Islander/Asian Americans. As stated in the Introduction, African American and Hispanic women's screening rates continued to climb until the late 1990s, at which time Hispanic women's early detection rates began to decline and African American women's began to plateau. In part because of the large numbers of cases, the increase in early stage over the time period is highly significant statistically in all groups (chi-square ranging from 33 to 360, $p = 0$).

Discussion

One of the nation's Year 2015 public health goals has been to reduce breast cancer mortality by 50%.^{25,26} This study explored stage of breast cancer detection because it is a reliable surrogate for survival rates. To increase the detection of early stage breast cancer, the national goal has been to increase adherence to breast cancer screening guidelines among women aged ≥ 40 years to 90%.^{25,26} However, as the data in this analysis show, there has been a plateau in the percentage of early stage breast cancers detected in California since the mid-1990s, and the level of this plateau falls considerably below the national goal for annual screening rate.

Data from the Behavioral Risk Factor Surveillance Survey (BRFSS) have shown a parallel plateau in the annual rates of reported mammography screening. This suggests that if the 50% reduction in the breast cancer mortality rate is to be achieved, adherence to mammography screening guidelines and, hence, early detection rates must first be increased.

Several sociological models of behavior can help us to understand why adherence to mammography is lower than the national goal. Rogers' Diffusion of Innovations Theory

states that peoples' willingness to adopt change is based on their evaluation of the innovation and that this process is influenced by their level of education and awareness of the innovation.²⁷ According to Rogers' Diffusion Theory some people adopt a change very rapidly (early adopters) and with minimal evidence of its value, whereas the majority of people who adopt a new innovation will require increasing levels of evidence to support the value of adopting the new behavior. In addition, a small group of late adopters will be hesitant to adopt change even after it has become a social norm or may not have the awareness of the product or financial capacity to make the transition. A final group (laggards) may find that the product simply does not comply with their values and may never become adopters. Among these groups of women, socioeconomic factors, environmental factors, and cultural factors will also influence adoption of health promotion behaviors. Unfortunately, the limitations of the CCR database prevent the study of such factors in relation to the impact of educational programs and socioeconomic, environmental, and cultural factors on mortality.

When Rogers' theory is applied to mammography use, it is clear that there will be some women in the laggard group who are highly unlikely to engage in breast cancer screening. This raises the question of what is the realistic goal to set for early breast cancer detection. The limits of screening technology result in missing between 8% and 10% of breast cancers.^{28,29} This suggests that the maximal attainable screening rate is about 90%–92%. Although we cannot predict the exact number of woman who as members of the laggard group, will never use mammography, it is reasonable to assume it will be a small percentage. However, the screening rates attained for white and Asian women clearly underscore that the ceiling of the rate of early detection rates certainly has not been achieved for Hispanic and African American women.²⁴ Equally important, as the white women's screening rates suggest, higher rates of early detection are also feasible for the Pacific Islander/Asian American women.²⁴ There are some

known exceptions that may lower the limit on early breast cancer detection. At least a proportion of women aged ≥ 50 will have life-limiting comorbidities of sufficient gravity to make breast cancer screening of questionable value and, in some instances, a physical impossibility. This circumstance most likely accounts for a small but unknown number of additional women who are not appropriate to refer for screening.

To optimize early breast cancer detection rates for the rest of each of these groups of slow-to-adopt women, efforts need to be focused on identifying and understanding the motivators and barriers to screening that are faced by the members of each of these comparatively small groups of nonadherent women.

Along with Rogers' Diffusion of Innovations theory, other psychosocial theories offer models related to decision-making behaviors that may be helpful in pinpointing more effective strategies for addressing this challenge. Prochaska's Stages of Change Theory, for example, proposes that people transition through several distinct phases on their way toward acting on a recommendation to behave differently.³⁰ In the precontemplative stage are those women who have not even heard of the value of breast cancer screening; also, low-income women may not yet know that they can get free mammograms in California. Thus, it is possible that these slow-to-adopt women are merely at an earlier stage of change than the early adopters.

Another theoretical framework, offered by the Health Belief Model, recognizes that people need to perceive the presence of a health threat, believe in the efficacy of the intervention, believe that the benefits outweigh the negatives that accompany the intervention, and receive repeated cues to action.

These three theories and others help explain the gradual spread of a new health promoting behavior. Health policymakers and others witnessed the sudden jump in breast cancer detection that occurred after President Gerald Ford and Vice President Nelson Rockefeller and later President Reagan publicly announced that their wives had breast cancer. Dubbed "the Betty Ford effect," the jump in breast cancer early detection rates that followed these announcements was believed to be the result of the early adopters engaging in screening activities. These same appearances also made it possible to use both the word "breast" and the word "cancer" in public everyday conversation. Although these announcements created a measurable increase in detection/screening rates, the medical plights of these highly visible white women may not have produced the equivalent uptake in screening rates among nonwhite women that it did among white women, thereby delaying the start of the screening uptake trend in nonwhite women.^{31,32} Subsequently, it became increasingly acceptable to discuss breast cancer in public. In the following decades, breast cancer educational campaigns were launched by such groups as the ACS, the NCI, the Susan G. Komen Breast Cancer Foundation, and state and local health agencies. In addition to mainstream campaigns, new campaigns focused on nonwhite women were launched. The combined effect of all these various efforts was to prompt early adopters among the nonwhite women to engage in screening behaviors and to prompt the intermediate adopters among the white women to take up screening activities on a regular basis.

The obvious, and possibly erroneous, conclusion from these impressions is that the screening gap is largely due to the earlier personalization and, hence, impact of this breast cancer information on white women than nonwhite women and that the discrepancy will naturally correct itself over time. However, the plateau in mammography screening rates reported in the BRFSS and California Facts and Figures²⁴ and the plateau in early detection rates identified in this data analysis raise questions about the feasibility of this expectation occurring without further interventions to promote screening among African American and Hispanic women. The plateau in screening and early detection rates suggests that alternative strategies will be needed to reach African American and Hispanic women. New dissemination and intervention strategies that go beyond the scope of traditional educational approaches may be needed to reach women who are among the slowest to adopt the recommended breast cancer guidelines.³³

While new intervention strategies are being developed, tested, and implemented, healthcare providers continue to be in an optimal position to help reduce the disparities in breast cancer early detection rates. Given that women are more likely to be screened if a healthcare provider tells them to do so and that providers know which of their patients are not adhering to screening guidelines, providers are clearly in a position to accomplish the greatest immediate increase in the breast cancer screening rates and to sustain that increase.

Conclusions

Early breast cancer detection rates reached a plateau at 70% in the mid-1990s in spite of ongoing efforts to promote adherence to recommended breast cancer screening guidelines. This situation will likely make it difficult to reach the 2015 goal of reducing breast cancer mortality rates by 50%. Of equal concern, a parallel plateau was noted among African American and Hispanic women, but at a considerably lower rate than other ethnic groups. This suggests that healthcare providers must continue to encourage all their patients to adhere to recommended screening guidelines and that focused education programs continue to be needed as additional sources of encouragement to promote African American and Hispanic women's adherence to screening guidelines. Only the data related to Pacific Islander/Asian American women demonstrated a sustained rise in early detection rates, even surpassing the highest rate achieved among white women and underscoring that continued improvement is feasible for all other ethnic groups.

Acknowledgments

This study was funded by the National Cancer Institute grants R25 CA65745, P30 CA023100, 1U54CA132379, and 1U54CA132384, and the National Institutes of Health, Division of National Center on Minority and Health Disparities-sponsored (P60 MD000220) UCSD Comprehensive Research Center in Health Disparities.

The collection of cancer incidence data used in this study was supported by the California Department of Health Services as part of the statewide cancer reporting program mandated by the California Health and Safety Code Section 103885, the National Cancer Institute's Surveillance, Epide-

miology and End Results program, and the Centers for Disease Control and Prevention national program of cancer registries. The ideas and opinions expressed herein are those of the authors, and endorsement of the State of California Department of Health Services, the National Cancer Institute, and the Centers for Disease Control and Prevention is not intended nor should it be inferred.

Disclosure Statement

The authors have no conflicts of interest to report.

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Address correspondence to:
Sidney L. Saltzstein, M.D., M.P.H.
Moores UCSD Cancer Center
3855 Health Sciences Drive 0850
La Jolla, CA 92093-0850
E-mail: ssaltzstein@UCSD.edu