# Socioeconomic Status, Immigration/Acculturation, and Ethnic Variations in Breast Conserving Surgery, San Francisco Bay Area

Scarlett L. Gomez, PhD;
Anne-Marie France, BA; Marion M. Lee, PhD

**Objective:** Previous studies have demonstrated substantial variations in breast conserving surgery (BCS) across sociodemographic groups. This study explored the joint influences of socioeconomic, immigration/acculturation, and clinical factors on ethnic differences in breast cancer surgery for early-stage disease.

**Design:** The study used interview data for 297 women, under the age of 70, who resided in the San Francisco Bay area, and had been diagnosed with primary early-stage breast cancer (carcinoma *in-situ* or invasive) between January 1990 and December 1992.

**Results:** The proportion of patients who either had undergone BCS or had no surgery was 45%, 20%, 45%, and 34%, among Whites, Chinese, Blacks, and Hispanics, respectively. The proportion of patients diagnosed at *in-situ* or localized stages, with tumors of less than 4 centimeters, was higher among those who received BCS or no surgery, compared to those who had undergone a mastectomy. White women who received BCS/no surgery tended to be younger than their counterparts who underwent mastectomies, but Chinese and Black women who received BCS/no surgery were older. The proportion of women diagnosed in smaller, private hospitals was higher among those receiving BCS/no surgery, although these associations varied by ethnicity. Women who had undergone BCS/no surgery were characterized as being of higher socioeconomic status, more acculturated, and less likely to be recent immigrants. In a multivariate regression model adjusting for clinical, socioeconomic, and immigration/acculturation factors, Chinese women were more likely than Whites to have a mastectomy, rather than BCS/no surgery (odds ratio, 2.8; 95% confidence interval, 1.0–7.8).

**Conclusions:** Use of BCS or no surgery was associated with various clinical, socioeconomic, and immigration/acculturation characteristics, although some of the associations varied by ethnicity. However, these factors did not account for the reduced presence of BCS, or no surgery, among Chinese women. (*Ethn Dis*. 2004;14:134–140)

**Key Words:** Breast Conserving Surgery, Mastectomy, Asian, Chinese, Immigration, Acculturation

From the Northern California Cancer Center, Union City (SLG, AF); Division of Epidemiology, Department of Health Research and Policy, Stanford University School of Medicine, Stanford (SLG); Department of Epidemiology and Biostatistics, School of Medicine, University of California, San Francisco (MML), California.

Address correspondence and reprint requests to Scarlett Lin Gomez, PhD; Northern California Cancer Center; 32960 Alvarado-Niles Road, Suite 600; Union City, CA 94587; 510-429-2594; 510-991-4405 (fax); 510-429-2550 (fax); slin@nccc.org

## Introduction

Despite findings that breast-conserving surgery (BCS) followed by radiotherapy confers a chance for survival equal to that of total breast removal for tumors of 4 centimeters or less, and contrary to recommendations for BCS from the National Institutes of Health,[1] there continue to be substantial geographic, socioeconomic, and ethnic variations in the United States (US) for the use of BCS to treat early-stage breast cancer.[2–4] A recent analysis of California Cancer Registry data showed that despite an overall increasing trend in the use of BCS to treat early-stage breast cancer, younger women were significantly more likely than older women to undergo breast conserving surgery, and the BCS prevalence among Asian and Pacific Islander women remained markedly lower.[3] The lower BCS usage among Asian women has been documented in several other studies.[5–8]

Patient, physician, and facility characteristics have been shown to be associated with BCS. These characteristics, including lower patient socioeconomic status,[4,9–11] physician factors, such as sex[9] and year of training,[12,13] extent of communication between physician and patient,[9] and hospital of diagnosis,[13–15] have also been shown to explain some of the observed Black-White differences in BCS use.[10,14,16] A patient's geographic location of residence may also be important in influencing the treatment; in particular, women living in regions with limited access to radiation facilities were more likely to have mastectomies.[17–19] However, other than 2 studies conducted in the Greater Bay Area Cancer Registry (GBACR), a participant in the Surveillance Epidemiology End Results (SEER) program,[7,8] ours is the only study to include women in other ethnic groups, and to examine the joint roles of clinical, socioeconomic, and immigration/acculturation factors in ethnic variations in BCS. Although mastectomy remains an alternative to BCS, it may be associated with poorer subsequent quality of life, particularly in the area of body image.[20,21]

We used a data set previously collected to examine variations in alternative and complementary therapy use among non-Hispanic White, Chinese, Black, and Hispanic women[6] to evaluate ethnic differences in BCS, and to determine the extent to which clinical, socioeconomic, and acculturation/immigration factors are associated with these ethnic differences.

## Methods

Details of subject selection, recruitment, and interview were described previously.[6] Briefly, 379 women under the age of 70, who resided in the San Francisco Bay Area counties of San Francisco or Santa Clara, and had been diagnosed with primary breast cancer (carcinoma *in-situ* or invasive) between January

1990 and December 1992, were identified by ethnicity through the GBACR, operated by the Northern California Cancer Center. Of the 435 eligible women, 379 participated in a telephone interview conducted in 1995 and 1996, with participation rates of 94% for non-Hispanic Whites, 71% for Chinese, 94% for Blacks, and 95% for Hispanics. The interview was conducted in English, Cantonese, Mandarin, or Spanish, according to the interviewee's preference, and included questions on language use, acculturation, and birthplace, the type, frequency, and length of use of various therapies (both conventional and complementary), social support, general attitude toward life, smoking, alcohol consumption, exercise habits, education and household income, support groups attended, or counseling received, and pregnancy and health history.

Interview data from these 97 White, 82 Chinese, 100 Black, and 100 Hispanic women were linked to the tumor registry to attain information on clinical factors, including stage, grade, and size of tumor, hospital of diagnosis, attending physician, and treatment information. Three subjects were no longer in the registry, or had been updated and no longer fit the study criteria. One subject was dropped due to lack of sufficient identifiers to link to the registry.

We further restricted our analysis to subjects diagnosed with *in-situ,* local, or regional stage disease, as NCI guidelines recommend BCS with radiation and axillary lymph-node dissection (where appropriate) for the majority of these cases.[1] Localized tumors are defined as those confined to the breast tissue, while regional tumors have penetrated beyond the tissue, or involve regional lymph nodes.[22] Our final sample comprised 297 women, of whom 73 were White, 65 were Chinese, 76 were Black, and 83 were Hispanic. Although the cancer registry collects ethnicity information, ethnicity in this analysis is based on self-report.

We defined the outcome as having undergone a mastectomy vs BCS (partial mastectomy, with or without lymph node dissection)[23] or no surgery for treatment of early-stage breast cancer (the percentage of women receiving no surgery was very small). The type of surgery was based on both self-report from the interview, and treatment data recorded in the registry; if these two sources disagreed, the more extreme type of surgery was used in the analyses. Tumor size was analyzed as a categorical variable; tumors larger than 4 centimeters are generally not considered amenable to breast conservation, as clinical trials primarily have included women with tumors less than 4 centimeters in diameter.[1] We evaluated whether women receiving BCS/no surgery were receiving appropriate adjuvant radiotherapy. Among women receiving BCS or no surgery, 88% had received radiation; 12 of the 13 women who did not receive radiation after BCS/no surgery were diagnosed with *in-situ* stage disease.

Previous studies have demonstrated associations between hospital characteristics and surgery type.[7,13–15] We obtained information from the Office of Statewide Health Planning and Development (OSHPD) Hospital Data Query System,[24] which reports public financial and utilization data from California hospitals. Using these data, we classified the diagnosing hospitals by ownership (private or public/other) and size (fewer than 200 beds, or 200 beds or more).

Odds ratios (OR) and 95% confidence intervals (CI) (computed using unconditional logistic regression) were used to estimate the relative odds of each ethnic group (compared to Whites) for having mastectomy, vs BCS/no surgery. Clinical and sociodemographic factors were added to the model in the order of the magnitude of their ORs in unadjusted models, as well as their impact on the ORs for each ethnic group. Statistical Analysis Software (SAS) version 6.12 was used for all analyses.

## RESULTS

Table 1 shows the distributions of clinical and socioeconomic factors by ethnicity and surgery type. The proportion of patients who underwent BCS or no surgery was 45.2%, 20.0%, 44.7%, and 33.7% in Whites, Chinese, Blacks, and Hispanics, respectively. These percentages are comparable to those of women in the registry, diagnosed with early-stage breast cancer during the same time period, who had received BCS (39.5%). The proportion of patients in each ethnic group diagnosed with *in-situ* or local-stage disease was higher, although not significantly, among those who had BCS or no surgery, compared to those who had mastectomy (except for Blacks). Women with BCS/no surgery were slightly, although not significantly, more likely to have tumors of less than 4 centimeters, compared to women who had mastectomies. However, the proportion of women with advanced grade disease appeared to be comparable between the 2 surgical groups, regardless of ethnicity. White women who had BCS/no surgery were slightly younger than those who received mastectomies. This age trend was not seen for the other ethnic groups; in fact, there appeared to be an opposite trend among Chinese and Blacks. Among Chinese and Hispanic women who received BCS/no surgery, slightly more patients were diagnosed in 1992 than in 1990 or 1991; among White women, a significantly opposite trend was seen. There were no significant differences in surgery type by hospital characteristics, except for Hispanics, among whom the use of mastectomy was associated with diagnosis in public hospitals. A higher proportion of women who received BCS/no surgery had high school education (except Chinese), health insurance, and higher income (except Whites), compared to women who received mastectomies; however, most of these patterns were not statistically significant. Among Chi-

**Table 1. Relative distribution (%) of clinical and sociodemographic characteristics among early stage* breast cancer patients by ethnicity and surgery type, San Francisco Bay Area, 1990–1992 (*N*=297)**

| Characteristic | White (*N*=73) | | Chinese (*N*=65) | | Black (*N*=76) | | Hispanic (*N*=83) | |
|---|---|---|---|---|---|---|---|---|
| | BCS†/No Surgery (*N*=33) | Mastectomy (*N*=40) | BCS/No Surgery (*N*=13) | Mastectomy (*N*=52) | BCS/No Surgery (*N*=34) | Mastectomy (*N*=42) | BCS/No Surgery (*N*=28) | Mastectomy (*N*=55) |
| Stage | | | | | | | | |
| *In-situ* or local | 84.9 | 75.0 | 92.3 | 73.1 | 64.7 | 66.7 | 82.1 | 61.8 |
| Regional | 15.2 | 25.0 | 7.7 | 26.9 | 35.3 | 33.3 | 17.9 | 38.2 |
| *P* value‡ | .300 | | .268 | | .858 | | .059 | |
| Histologic grade | | | | | | | | |
| Well differentiated | 6.1 | 10.0 | 15.4 | 5.8 | 11.8 | 14.3 | 7.1 | 7.3 |
| Moderately differentiated | 45.5 | 27.5 | 15.4 | 28.9 | 23.5 | 21.4 | 35.7 | 34.6 |
| Poorly or un-differentiated | 21.2 | 35.0 | 38.5 | 23.1 | 41.2 | 28.6 | 28.6 | 38.2 |
| Unknown | 27.3 | 27.5 | 30.8 | 42.3 | 23.5 | 35.7 | 28.6 | 20.0 |
| *P* value | .384 | | .351 | | .596 | | .784 | |
| Tumor size | | | | | | | | |
| <1 cm | 25.8 | 24.3 | 15.4 | 6.7 | 15.6 | 5.7 | 11.1 | 10.0 |
| 1 to 1.99 cm | 54.8 | 35.1 | 53.9 | 42.2 | 50.0 | 37.1 | 51.8 | 30.0 |
| 2 to 3.99 cm | 19.4 | 35.1 | 23.1 | 31.1 | 31.3 | 42.9 | 29.6 | 44.0 |
| ≥4 cm | 0 | 5.4 | 7.7 | 20.0 | 3.1 | 14.3 | 7.4 | 16.0 |
| *P* value | .201 | | .522 | | .158 | | .249 | |
| Age at diagnosis (mean/median) | 54.1/51.0 | 56.3/56.0 | 58.0/59.0 | 53.0/52.5 | 56.3/56.0 | 54.5/53.5 | 56.5/56.0 | 55.5/57.0 |
| <47 | 21.2 | 17.5 | 7.7 | 38.5 | 17.7 | 26.2 | 28.6 | 23.6 |
| 47 to 54 | 33.3 | 22.5 | 38.5 | 23.1 | 26.5 | 26.2 | 14.3 | 14.6 |
| 55 to 65 | 21.2 | 17.5 | 30.8 | 17.3 | 26.5 | 28.6 | 21.4 | 40.0 |
| >65 | 21.2 | 42.5 | 23.1 | 21.2 | 29.4 | 19.1 | 35.7 | 21.8 |
| *P* value | .284 | | .146 | | .683 | | .325 | |
| Diagnosis year | | | | | | | | |
| 1990 | 21.2 | 37.5 | 15.4 | 34.6 | 32.4 | 19.0 | 7.1 | 18.2 |
| 1991 | 42.4 | 12.5 | 30.8 | 30.8 | 29.4 | 38.1 | 10.7 | 23.6 |
| 1992 | 36.4 | 50.0 | 53.9 | 34.6 | 38.2 | 42.9 | 82.1 | 58.2 |
| *P* value | .014 | | .372 | | .398 | | .108 | |
| Hospital size ≥200 beds | 69.7 | 77.5 | 46.2 | 55.8 | 55.9 | 64.3 | 67.9 | 78.2 |
| *P* value | .450 | | .534 | | .456 | | .306 | |
| Public hospital type | 36.4 | 25.0 | 23.1 | 26.9 | 17.7 | 31.0 | 7.1 | 40.0 |
| *P* value | .292 | | 1.00 | | .183 | | .002 | |
| <High school education | 15.2 | 35.0 | 58.3 | 48.1 | 41.2 | 52.4 | 64.3 | 70.9 |
| *P* value | .054 | | .522 | | .331 | | .539 | |
| No health insurance | 12.5 | 35.0 | 25.0 | 38.5 | 29.4 | 33.3 | 35.7 | 46.2 |
| *P* value | .033 | | .512 | | .715 | | .368 | |

**Table 1. Continued**

| Characteristic | White (*N*=73) | | Chinese (*N*=65) | | Black (*N*=76) | | Hispanic (*N*=83) | |
|---|---|---|---|---|---|---|---|---|
| | BCS†/No Surgery (*N*=33) | Mastectomy (*N*=40) | BCS/No Surgery (*N*=13) | Mastectomy (*N*=52) | BCS/No Surgery (*N*=34) | Mastectomy (*N*=42) | BCS/No Surgery (*N*=28) | Mastectomy (*N*=55) |
| Annual household income ≤$20,000 | 24.1 | 22.9 | 20.0 | 34.9 | 45.2 | 51.4 | 38.1 | 58.3 |
| *P* value | .904 | | .471 | | .611 | | .122 | |
| Recent immigrant§ | 3.0 | 5.0 | 25.0 | 42.3 | 0 | 0 | 7.1 | 10.9 |
| *P* value | 1.00 | | .338 | | 1.00 | | .711 | |
| Prefers non-English as primary language | 15.1 | 10.0 | 53.9 | 80.8 | 0 | 0 | 60.7 | 69.1 |
| *P* value | .723 | | .044 | | 1.00 | | .445 | |

* Restricted to *in-situ*, localized, or regional stage cases.
† BCS = breast conserving surgery; surgery type based on self-report and data in the cancer registry.
‡ *P* values based on chi-square or Fisher's Exact Test.
§ "Recent immigrant" = those who self-reported being born outside of the United States and who immigrated less than 15 years prior to the date of interview.

*. . . other than 2 studies conducted in the Greater Bay Area Cancer Registry (GBACR),[7,8] . . . ours is the only study to include women in other ethnic groups, and to examine the joint roles of clinical, socioeconomic, and immigration/acculturation factors in ethnic variations in BCS.*

nese and Hispanics, women who received mastectomies were more likely to be recent immigrants, and to use a language other than English as their primary language, compared to their BCS/no surgery counterparts; the association with language was statistically significant among Chinese.

Table 2 shows the odds ratios and 95% CIs for each ethnic group (relative to Whites) on having mastectomy vs BCS/no surgery. Chinese women were more than 3 times as likely as Whites to have mastectomies, although the confidence intervals in these models were wide, given the small sample sizes. Some of these differences were attributable to the tendency of Chinese women to be diagnosed with larger tumor sizes. Age and year of diagnosis also explained a small part of the variation in surgery between Chinese and Whites. The differences in immigration and education between Chinese and Whites also accounted for some of the variation in surgery type, while language and income accounted for a smaller proportion. However, even with adjustment for all of these factors, Chinese remained nearly three times more likely than Whites to have mastectomies, although the confi-

dence interval for this model included 1.0.

In our sample, Black women were not more likely to have mastectomies than Whites, while Hispanic women were slightly more likely, although the confidence intervals overlapped one. Adjusting for the clinical and socioeconomic factors decreased the magnitude of the OR for Hispanics to nearly one. The factors most responsible for the differences in surgery between Hispanics and Whites were tumor size and education.

Marital status and self-reported comorbid conditions did not appear to be associated with surgery type in our sample, and their addition to the multivariate model did not affect the ORs for any of the ethnic groups (data not shown).

**Table 2. Odds ratios (and 95% confidence intervals) associated with having a mastectomy, relative to having no surgery or breast conserving surgery, San Francisco Bay Area, 1990–1992 (*N*=297)**

| Covariates* Included in Model | White (Reference) | Chinese | Black | Hispanic |
|---|---|---|---|---|
| Ethnicity (self-report) | 1.0 | 3.30 (1.54–7.08) | 1.02 (0.53–1.94) | 1.62 (0.85–3.10) |
| All of above + age and year of diagnosis (1990 vs 1991–92) | 1.0 | 3.24 (1.50–7.00) | 1.02 (0.53–1.96) | 1.63 (0.84–3.18) |
| All of above + tumor size | 1.0 | 3.16 (1.43–6.96) | 0.95 (0.49–1.86) | 1.46 (0.74–2.91) |
| All of above + stage | 1.0 | 3.20 (1.45–7.08) | 0.91 (0.47–1.80) | 1.46 (0.73–2.91) |
| All of above + grade | 1.0 | 3.14 (1.41–7.00) | 0.89 (0.45–1.76) | 1.46 (0.73–2.91) |
| All of above + hospital size | 1.0 | 3.38 (1.50–7.61) | 0.93 (0.47–1.85) | 1.47 (0.74–2.94) |
| All of above + hospital type | 1.0 | 3.36 (1.49–7.59) | 0.94 (0.47–1.87) | 1.49 (0.74–2.98) |
| All of above + immigration | 1.0 | 2.95 (1.23–7.10) | 0.98 (0.49–1.97) | 1.46 (0.72–2.94) |
| All of above + language | 1.0 | 2.90 (1.11–7.57) | 0.99 (0.49–1.99) | 1.43 (0.64–3.20) |
| All of above + education | 1.0 | 2.77 (1.05–7.27) | 0.87 (0.43–1.79) | 1.21 (0.53–2.79) |
| All of above + income | 1.0 | 2.72 (0.97–7.61) | 0.74 (0.34–1.65) | 1.30 (0.53–3.22) |
| All of above + health insurance | 1.0 | 2.79 (1.00–7.80) | 0.74 (0.33–1.63) | 1.26 (0.51–3.12) |

* As defined in Table 1, unless otherwise specified.

## DISCUSSION

Treatment decisions in early-stage breast cancer are obviously complex; decisions may be associated with personal, institutional, and clinical factors, and may vary by ethnicity. Using subject interview data combined with cancer registry data, we found marked differences in breast cancer surgery type among women diagnosed with early-stage breast cancer. Most notably, Chinese women were more likely than White, Black, or Hispanic women to have mastectomies, and were therefore less likely to have BCS or no surgery. Only a small part of the difference in receipt of mastectomy vs BCS/no surgery between Chinese and Whites was explained by the clinical, socioeconomic, or immigration/acculturation characteristics available in this study.

Previous studies have also observed higher rates of mastectomy among Asian women.[3,5–8] Kagawa-Singer hypothesized that this observed pattern is due to cultural differences, such that Asian women place less significance on the breasts, compared to White women. In addition, the period of disability and reliance on others while undergoing the 5–6 weeks of radiation therapy following BCS may reduce a woman's abilities to fulfill her obligations to their family[5]; these cultural norms are consistent with our findings for immigration, which accounted for a sizable amount of the variation in treatment between Chinese and Whites. It is worth mentioning that mastectomy remains an alternative to BCS, followed by radiation and axillary dissection.[1] However, given that mastectomy may be associated with greater morbidity and poorer subsequent quality of life, particularly in the areas of sexuality and body image[20,21,25] future research might try to identify the reasons for Chinese and other Asian women being more likely to undergo the more radical type of surgery. Future studies might also include other factors that may influence treatment decisions, such as extent and quality of communication with the provider, and transportation and financial issues.

Most studies of factors associated with breast cancer treatment have focused primarily on White women, or had mostly White women in their samples. In our study, which included women from 4 ethnic groups, we found that some of the sociodemographic factors, such as age and education, had different associations with surgery type among ethnic groups. For example, most studies demonstrate that older women are less likely than younger women to have BCS.[3,4,15] We found that although increasing age was associated with reduced BCS or no surgery among White women, this association was not seen for other women. In fact, there was the suggestion of an opposite trend among Chinese and Black women. Barlow et al found that short-term financial costs

*We found that although increasing age was associated with reduced BCS or no surgery among White women, this association was not seen for other women.*

were higher for BCS than for mastectomy, although at 5 years, costs associated with BCS were higher.[26] Nevertheless, financial status and insurance may influence a patient's choice of therapy; indeed, some studies have found that lower socioeconomic status is associated with less use of BCS.[3,4,9,15,16] Although our results using self-reported measures of socioeconomic status, education, health insurance status, and income were mostly consistent with other studies, there were notable exceptions, such as an inverse association with education among Chinese, and the lack of an association with income among Whites.

The biggest limitation in our study is the small sample size, which hampered our statistical power. Our study also did not include other factors potentially associated with breast cancer treatment that have been identified in some studies, including distance to radiotherapy facilities and physician characteristics. The lower response rate among Chinese women in our study has been seen in other studies in this region, and may have resulted in an under-representation of Chinese women of lower socioeconomic status in our sample; however, there is no reason to believe that the associations found in our study would be biased by this. Our study has some noteworthy strengths, including its inclusion of women from different ethnic groups, thus allowing us to assess the impact of clinical and socioeconomic factors by ethnicity. The findings of this study are also strengthened by the supplementation of registry data with interview data, whereas other studies have relied on clinical information in the registry, and on socioeconomic data based on the Census. This is particularly relevant for treatment information, as registry data are limited to the first course of treatment (ie, treatment administered within 4 months of diagnosis), and for socioeconomic status, since area-based Census measures may not adequately capture an individual's socioeconomic status.

Despite overall adoption of BCS on a national level, and increasing BCS rates, certain racial/ethnic populations are still more likely to opt for complete breast removal rather than breast conservation. Additional research on breast cancer treatment patterns should aim to understand ethnic-specific and cultural factors, and the psychological outcomes associated with treatment choice.

**ACKNOWLEDGMENTS**

This research was supported by the US Army Research and Material Command under DAMD 17-94-J4223. A portion of the data was collected by the Northern California Cancer Center under contract N01-CN-65107 with the National Cancer Institute, National Institutes of Health, and with support of the California Cancer Registry, a project of the Cancer Surveillance Section, California Department of Health Services, under subcontract 1000891 with the Public Health Institute. The content of this publication does not necessarily reflect the views or policies of the US Department of Health and Human Services, or the California Department of Health Services, nor does mention of trade names, commercial products, or organizations imply endorsement by the US Government or the state of California.

**REFERENCES**

1. NIH Consensus Conference. Treatment of early-stage breast cancer. *JAMA.* 1991;265(3): 391–395.
2. Nattinger AB, Gottlieb MS, Veum J, Yahnke D, Goodwin JS. Geographic variation in the use of breast-conserving treatment for breast cancer. *N Engl J Med.* 1992;326:1102–1107.
3. Morris CR, Cohen R, Schlag R, Wright WE. Increasing trends in the use of breast-conserving surgery in California. *Am J Public Health.* 2000;90:281–284.
4. Gilligan AM, Kneusel RT, Hoffmann RG, Greer AL, Nattinger AB. Persistent differences in sociodemographic determinants of breast conserving treatment despite overall increased adoption. *Med Care.* 2002;40(3):181–189.
5. Kagawa-Singer M, Wellisch DK, Durvasula R. Impact of breast cancer on Asian-American and Anglo-American women. *Cult Med Psychiatry.* 1997;21(4):449–480.
6. Lee MM, Lin SS, Wrensch MR, Adler SR, Eisenberg D. Alternative therapies used by women with breast cancer in four ethnic populations. *J Natl Cancer Inst.* 2000;92(1):42–47.
7. Lin SS, Phan JC, Lin AY. Breast cancer characteristics of Vietnamese women in the Greater San Francisco Bay Area. *West J Med.* 2002; 176:87–90.
8. Prehn AW, Topol B, Stewart S, Glaser SL, O'Connor L, West DW. Differences in treatment patterns for localized breast carcinoma among Asian/Pacific Islander women. *Cancer.* 2002;95(11):2268–2275.
9. Cyran EM, Crane LA, Palmer L. Physician sex and other factors associated with type of breast cancer surgery in older women. *Arch Surg.* 2001;136(2):185–191.
10. Michalski TA, Nattinger AB. The influence of Black race and socioeconomic status on the use of breast-conserving surgery for Medicare beneficiaries. *Cancer.* 1997;79(2):314–319.
11. Norredam M, Groenvold M, Petersen JH, Krasnik A. Effect of social class on tumor size at diagnosis and surgical treatment in Danish women with breast cancer. *Soc Sci Med.* 1998; 47(11):1659–1663.
12. Jubelirer SJ, Harpold R, Miller S, Keener B, Slemp C. An analysis of factors determining the use of breast conserving surgery for treating early-stage breast cancer. *W V Med J.* 2001;97(3):144–147.
13. Kotwall CA, Covington DL, Rutledge R, Churchill MP, Meyer AA. Patient, hospital, and surgeon factors associated with breast conservation surgery. A statewide analysis in North Carolina [discussion 426–9]. *Ann Surg.* 1996;224(4):419–426.
14. Satariano ER, Swanson GM, Moll PP. Nonclinical factors associated with surgery received for treatment of early-stage breast cancer. *Am J Public Health.* 1992;82(2):195–198.
15. Polednak AP. Trends in, and predictors of, breast-conserving surgery and radiotherapy for breast cancer in Connecticut, 1988–1997. *Int J Radiat Oncol Biol Phys.* 2002;53(1):157–163.
16. Bradley CJ, Given CW, Roberts C. Race, socioeconomic status, and breast cancer treatment and survival. *J Natl Cancer Inst.* 2002; 94(7):490–496.
17. Maskarinec G, Dhakal S, Yamashiro G, Issell BF. The use of breast conserving surgery: linking insurance claims with tumor registry data. *BMCCancer.* 2002;2(1):3.
18. Nattinger AB, Kneusel RT, Hoffmann RG,

Gilligan MA. Relationship of distance from a radiotherapy facility and initial breast cancer treatment. *J Natl Cancer Inst.* 2001;93(17): 1344–1346.
19. Polednak AP. Predictors of breast-conserving surgery in Connecticut, 1990–1992. *Ann Surg Oncol.* 1997;4(3):259–263.
20. Rowland JH, Desmond KA, Meyerowitz BE, Belin TR, Wyatt GE, Ganz PA. Role of breast reconstructive surgery in physical and emotional outcomes among breast cancer survivors. *J Natl Cancer Inst.* 2000;92(17):1422–1429.
21. Moyer A. Psychosocial outcomes of breast-conserving surgery versus mastectomy: a meta-analytic review. *Health Psychol.* 1997; 16(3):284–298.
22. SEER Program, Cancer Statistics Branch, Division of Cancer Prevention and Control, National Cancer Institute. *SEER Program: Comparative Staging Guide for Cancer, Version 1.1.* Bethesda, Md: National Cancer Institute; June 1993. NIH Publication No. 93-3640.
23. *Surveillance Epidemiology and End Results Program, National Cancer Institute* [SEER public use tape]. Bethesda, Md: National Cancer Institute; April 2002.
24. Office of Statewide Health Planning and Development (OSHPD) Web site. Available at: http://www.oshpd.cahwnet.gov/.
25. Nissen MJ, Swenson KK, Ritz LJ, Farrell JB, Sladek ML, Lally RM. Quality of life after breast carcinoma surgery: a comparison of three surgical procedures. *Cancer.* 2001;91(7): 1238–1246.
26. Barlow WE, Taplin SH, Yoshida CK, Buist DS, Seger D, Brown M. Cost comparison of mastectomy versus breast-conserving therapy for early-stage breast cancer. *J Natl Cancer Inst.* 2001;93(6):447–455.

## AUTHOR CONTRIBUTIONS

*Design and concept of study:* Gomez
*Acquisition of data:* Lee
*Data analysis and interpretation:* Gomez, France, Lee
*Manuscript draft:* Gomez, France, Lee
*Statistical expertise:* Gomez, Lee
*Acquisition of funding:* Lee
*Administrative, technical, or material assistance:* Gomez, France
*Supervision:* Gomez