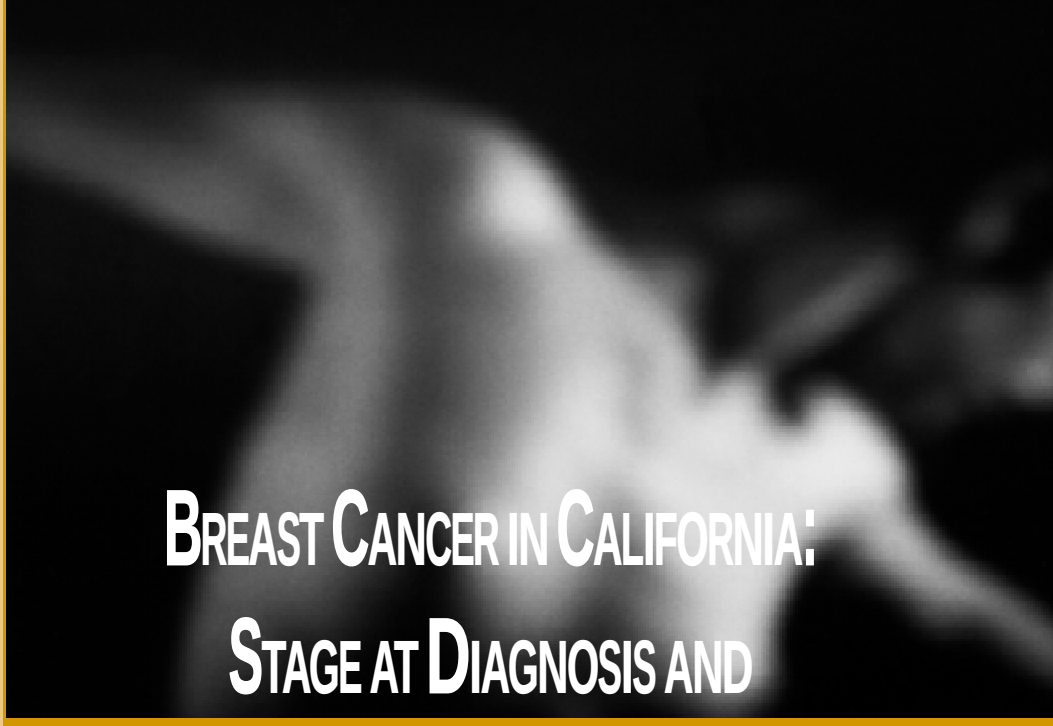
CALIFORNIA CANCER REGISTRY

Searching for Causes & Cures

BREAST CANCER IN CALIFORNIA:

Stage at Diagnosis and Medi-Cal Status



Breast Cancer in California: Stage at Diagnosis and Medi-Cal Status

Carin I. Perkins, M.S.
California Department of Health Services
Cancer Surveillance Section

Mark E. Allen, M.S.
Public Health Institute
California Cancer Registry

William E. Wright, Ph.D.
California Department of Health Services
Cancer Surveillance Section

Eugene Takahashi, Ph.D.
California Department of Health Services
Cancer Detection Section

Georjean Stoodt, M.D., M.P.H.
California Department of Health Services
Cancer Detection Section

Richard Cohen, M.S.
Public Health Institute
California Cancer Registry

March 2000

This publication was prepared by:

Cancer Surveillance Section
Cancer Control Branch
Division of Chronic Disease and Injury Control
California Department of Health Services
1700 Tribute Road, Suite 100
Sacramento, CA 95815-4402
(916) 779-0300
http://www.ccrcal.org

Suggested citation:

Perkins CI, Allen MA, Wright WE, Takahashi E, Stoodt G, Cohen R. Breast cancer in California: stage at diagnosis and Medi-Cal status. Sacramento, CA: California Department of Health Services, Cancer Surveillance Section, March 2000.

Design: Maggie Burgos, California Cancer Registry

TABLE OF CONTENTS

	Page
Executive Summary	7
Acknowledgements	9
Introduction	11
Methods	14
Results	19
Discussion	30
References	34
Figures	
Figure 1: Five-year relative survival for female breast cancer by SEER summary stage at diagnosis, SEER program, 1989-1995	11
Figure 2: Female breast cancer mortality by year and race/ethnicity, California, 1988-1996	12
Figure 3: Percent of women who had a mammogram in the past two years by age and income, California, 1997	13
Figure 4: SEER summary stage at diagnosis for breast cancers among women 30 to 64 years old by Medi-Cal status, California, 1993	22
Figure 5: AJCC summary stage at diagnosis for breast cancers among women 30 to 64 years old by Medi-Cal status, California, 1993	22
Figure 6: Tumor size among women 30 to 64 years old with localized breast cancer by Medi-Cal status, California, 1993	24
Figure 7: Number of lymph nodes with cancer among women 30 to 64 years old with regional breast cancer by Medi-Cal status, California, 1993	25
Figure 8: Adjusted proportional incidence ratios for late-stage breast cancer among women 30 to 64 years old by Medi-Cal status, California, 1993	28

Page

Tables

Table 1: Demographic and socioeconomic characteristics of women 30 to 64 years old diagnosed with breast cancer by Medi-Cal status, California, 1993 — 20

Table 2: Summary stage at diagnosis among women 30 to 64 years old diagnosed with breast cancer by Medi-Cal status, California, 1993 — 21

Table 3: Tumor size at diagnosis and estrogen receptor protein status among women 30 to 64 years old diagnosed with localized breast cancer by Medi-Cal status, California, 1993 — 23

Table 4: Number of regional lymph nodes with pathological evidence of cancer and estrogen receptor protein status among women 30 to 64 years old diagnosed with regional breast cancer by Medi-Cal status, California, 1993 — 24

Table 5: Percent of breast cancers diagnosed at late stage among women 30 to 64 years old by demographic and socioeconomic characteristics and Medi-Cal status, California, 1993 — 26

Table 6: Adjusted proportional incidence ratios (95% confidence intervals) for advanced disease among women 30 to 64 years diagnosed with breast cancer by Medi-Cal status, California, 1993 — 28

Table 7: Adjusted proportional incidence ratios (95% confidence intervals) for large tumors among women 30 to 64 years diagnosed with localized breast cancer by Medi-Cal status, California, 1993 — 29

Breast Cancer in California: Stage at Diagnosis and Medi-Cal Status

EXECUTIVE SUMMARY

Over the last decade, California has witnessed a dramatic increase in the number of women who are screened for breast cancer, and a significant decline in breast cancer mortality. Nonetheless, poor women are still less likely to be screened than women with higher incomes, and African American, Hispanic, and Asian women have yet to show significant decreases in mortality. For further gains to be made, efforts must be intensified to identify and remove barriers to breast cancer screening, especially among underserved populations.

Medi-Cal, California's Medicaid program, provides health care to approximately 800,000 women ages 30 to 64, about ten percent of women in that age group in California. Medi-Cal benefits for clinical breast examinations and mammography have historically been less restrictive than in many other health care plans. Nonetheless, this study provides strong indirect evidence that women who receive health care through Medi-Cal are less likely to be screened for breast cancer than other women in California.

Women on Medi-Cal were diagnosed with

- more advanced disease
- larger tumors
- more lymph nodes involved

than other women with breast cancer.

Among women ages 30 to 64 diagnosed with breast cancer in 1993, women with Medi-Cal benefits had a higher proportion of late-stage tumors than all other women, even after controlling for age, race/ethnicity, marital status, and education. Cases diagnosed in 1993 were analyzed because 1993 was the most recent year for which case reporting was complete when the study was initiated. In addition, women on Medi-Cal with localized breast cancer were more likely to have tumors two centimeters or larger in size, and those with regional disease were more likely to have four or more lymph nodes with evidence of cancer. All three of these outcomes are indicators of poor prognosis, resulting in poorer overall survival for women on Medi-Cal and potentially higher treatment costs for the Medi-Cal system.

This study has identified a critical opportunity to reduce breast cancer mortality in California.

These results indicate that providing a benefit is not sufficient to assure that the service will be utilized. Outreach and inreach programs targeted to this population and its providers are needed to increase regular breast cancer screening. This study has identified a critical opportunity to reduce breast cancer mortality in California, especially among women of color.

The proportion of breast cancers with poor prognostic factors was highest among women who were covered by Medi-Cal for only part of the year in which they were diagnosed. These women may only have applied for benefits after symptoms of breast cancer developed, and therefore may not have been covered by Medi-Cal when screening could have lead to earlier detection.

Women with Medi-Cal benefits for only part of the year in which they were diagnosed had an especially high proportion of late-stage disease.

However, even women who had Medi-Cal benefits during the entire year in which they were diagnosed had a significantly elevated proportion of breast cancers diagnosed at late stage, despite the fact that Medi-Cal covers the cost of screening mammograms and clinical breast exams. Non-Hispanic white and African American women with Medi-Cal benefits for the entire year were 25 percent more likely, and Asian women 70 percent more likely, to be diagnosed with late-stage tumors than women of the same race/ethnicity not covered by Medi-Cal, even after taking age, marital status, and education into account.

African American, Asian, and non-Hispanic white women with Medi-Cal benefits for the entire year were still significantly more likely to be diagnosed with late-stage disease than other women of the same race with breast cancer.

The Breast and Cervical Cancer Control Program and the Breast Cancer Early Detection Program are federally- and state-funded intervention programs initiated by the California Department of Health Services in 1991 and 1994, respectively. Using Medi-Cal providers who agree to participate and Medi-Cal reimbursement rates, these programs not only offer free screening to eligible women who are poor and uninsured, but forge community-based partnerships to provide outreach, education, social support, and services such as transportation and child care. In addition, considerable effort is expended to enhance the skills of participating health care providers in conducting clinical breast examinations, communicating effectively with clients, and tracking client need for and receipt of breast cancer screening and diagnostic services. Although the outreach activities of these programs are not specifically targeted to Medi-Cal beneficiaries, and women with Medi-Cal benefits are not eligible to be screened through these programs, such efforts may have increased screening among women on Medi-Cal since this study took place.

In addition, the number of Medi-Cal recipients receiving medical care through managed care programs has increased significantly in the last ten years. In 1993, about ten percent of women with Medi-Cal benefits ages 30 to 64 were in managed care programs. By 1999, the number had increased to 46 percent. One of the goals of moving clients into managed care programs was to improve use of preventive services among persons on Medi-Cal. Future studies should evaluate whether breast cancer outcomes have improved for women on Medi-Cal since 1993, and whether they are better among Medi-Cal women in managed care programs than among those in the fee-for-service system.

ACKNOWLEDGEMENTS

This study was a collaborative effort between the Cancer Surveillance Section, which is responsible for the California Cancer Registry (CCR), and the Cancer Detection Section, which is responsible for the implementation of state- and federally-funded breast cancer screening and diagnostic services in California. This study could not have been conducted without the assistance and cooperation of Gene Hiehle, Chief, Medical Care Statistics Section, and his staff, especially Samira Al-Qazzaz. We are deeply indebted to their expertise and willingness to accommodate our requests for data.

The Statewide Cancer Reporting Law mandated the creation of the CCR in 1985. Since then, the CCR has become recognized as one of the leading cancer registries in the world. We are deeply indebted to the many individuals and organizations who actively support the CCR, and especially to the California public on whose behalf we work. Recognition must also go to the CCR's regional registries and to California's cancer registrars who are responsible for collecting the cancer data upon which this work is based.

The CCR is a collaborative effort between the California Department of Health Services (CDHS) and the Public Health Institute. Data collection and report production were funded in part by the Preventive Health and Health Services Block Grant (98-B1-CA-PRVS-01), the Department of the Army CCR Enhancement for Breast Cancer Research (DAMD 17-94-J-4508), the California Tobacco Tax and Health Promotion Act of 1988, and the California Breast Cancer Act of 1993.

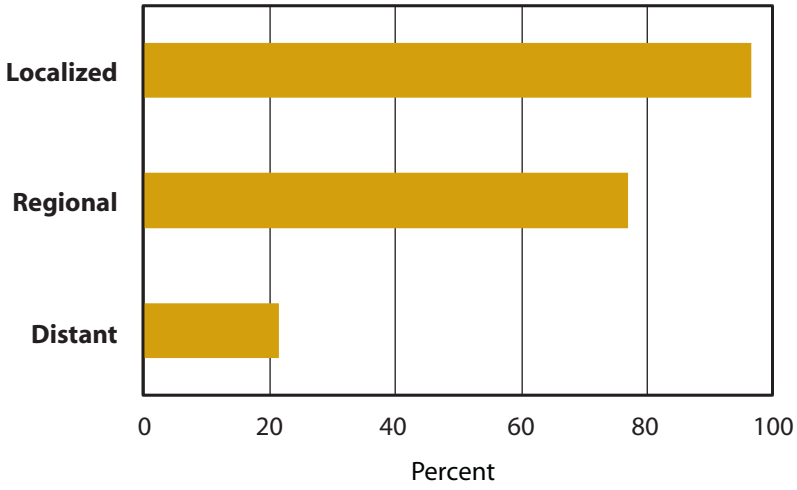
Inquiries regarding the content of this report should be directed to CDHS, Cancer Surveillance Section, 1700 Tribute Road, Suite 100, Sacramento, CA 95815-4402; by telephoning (916) 779-0300, or; by contacting us at our website at http://www.ccrcal.org.

Breast Cancer in California: Stage at Diagnosis and Medi-Cal Status

INTRODUCTION

One of the strongest predictors of breast cancer survival is the extent of disease at diagnosis, reflected in the size of the tumor, number of lymph nodes involved, and the tissues into which the cancer has spread when first discovered. Women whose cancer is confined to the breast have an excellent prognosis, with a five-year relative survival rate of 96 percent (Figure 1)(1). If the cancer has spread to lymph nodes or adjacent tissues, however, the five-year survival rate decreases to 77 percent. When the cancer has already spread to other parts of the body when discovered, five-year survival is only 21 percent.

Figure 1: Five-Year Relative Survival for Female Breast Cancer by SEER Summary Stage at Diagnosis, SEER Program, 1989—1995



Source: *SEER Cancer Statistics Review, 1973-1996.* National Cancer Institute, 1999.
SEER: Surveillance, Epidemiology, and End Results Program.

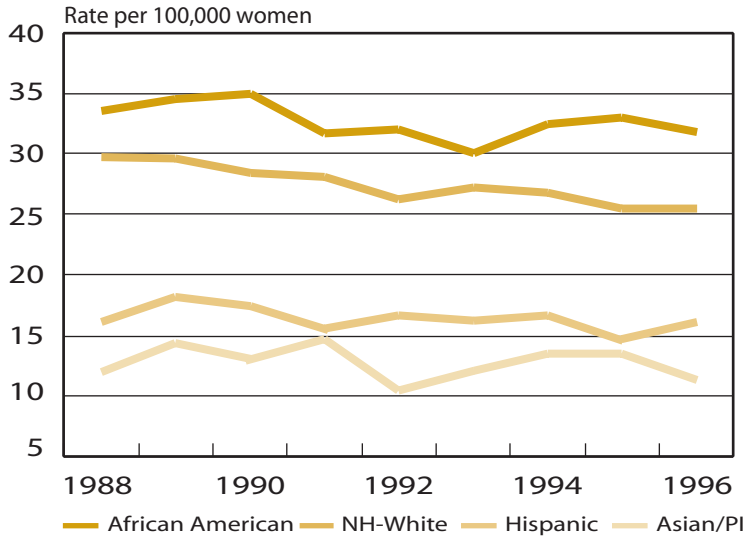
SEER Summary Stage at Diagnosis

In Situ	The tumor is at the earliest stage of development and has not extended through the first layer of cells in the area in which it is growing.
Localized	The tumor has broken through the first layer of cells, but is still confined to the breast.
Regional	The tumor has spread to lymph nodes or adjacent tissues.
Distant	The tumor has spread to other parts of the body.

Because of this close association between extent of disease and survival, early diagnosis is critical. Clinical trials have demonstrated that breast cancer screening can reduce mortality by 30 percent or more (2-7). A highly successful public health effort over the last decade has dramatically increased the number of women in California who report having a mammogram in the previous two years (8). Breast cancer mortality rates in California are now 20 percent lower than they were in 1973 (9, 10).

Nonetheless, breast cancer still kills more women 35 to 54 years old than any other single cause (11). In addition, African American, Hispanic, and Asian women have yet to show the significant decreases in breast cancer mortality demonstrated by non-Hispanic white women (Figure 2)(10). For further gains to be made, efforts must be intensified to identify and remove barriers to breast cancer screening, especially among underserved populations who may have little contact with the health care system (12).

Figure 2: Female Breast Cancer Mortality by Year and Race/Ethnicity, California, 1988—1996



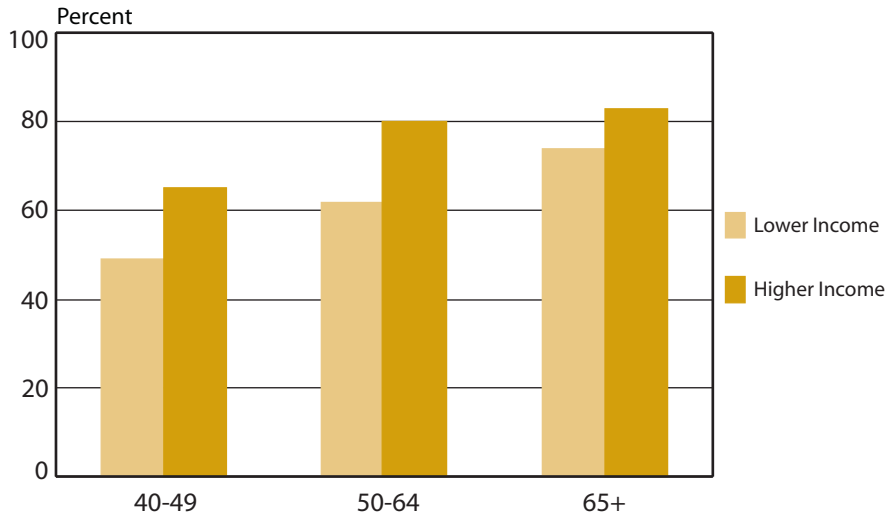
Source: *Cancer in California, 1988-1996.* California Department of Health Services, 1999. Rates are age-adjusted to the 1970 US population.

One potential barrier to routine screening is cost, and low income women in California are less likely than other women to receive mammograms (Figure 3)(8). Recognizing this need, state- and federally-funded breast cancer intervention programs have provided free mammograms and clinical breast exams to uninsured and underinsured low income women in California since 1992 (13). However, women covered by Medi-Cal, California's Medicaid program, are not eligible for screening through these programs because Medi-Cal benefits include mammograms and clinical breast exams when ordered by a health care provider.

Little information is available to indicate whether there is a need for intervention programs directly targeted to women receiving health care through Medi-Cal and their providers. Population-based screening rates among California women on Medi-Cal have not been reported. Data from the 1992 National Health Interview Survey showed that women on Medicaid nationwide were less likely to have had a mammogram in the previous two years than other insured women (14, 15), but data were not reported for individual states.

A number of large studies have demonstrated that a lower proportion of cancers are diagnosed at late stage when women receive routine breast cancer screening (16-18). Therefore, this study evaluated stage at diagnosis among Medi-Cal women

Figure 3: Percent of Women Who Had a Mammogram in the Past Two Years by Age and Income, California, 1997



Source: *Data Points: results from the 1997 California Women's Health Survey.* California Department of Health Services, 1998. Lower income women are at or below 200% of the Federal Poverty Level; all other income levels are included in the higher income category.

with breast cancer as indirect evidence of screening utilization. A higher proportion of advanced disease among women covered by Medi-Cal compared to other women with breast cancer is considered strong evidence that they are not being adequately screened or are not receiving timely diagnostic services following screening.

To determine which breast cancer patients were Medi-Cal recipients, Medi-Cal enrollment files for 1993 were linked with the statewide, population-based California Cancer Registry (CCR). The Medi-Cal status of all women 30 to 64 years old who were diagnosed with breast cancer in 1993 was thereby determined, including the number of months of Medi-Cal coverage during the calendar year. Several measures of breast cancer extent of disease at diagnosis were analyzed by Medi-Cal status: summary stage at diagnosis, tumor size, and number of regional lymph nodes with pathologic evidence of cancer. These outcomes are known to be associated with a number of factors other than type of insurance, such as age at diagnosis, race/ethnicity, income, education, marital status, urban/rural residence, and estrogen receptor status. These factors were, therefore, included in the analysis so that the independent contribution of Medi-Cal status could be assessed.

METHODS

Confidentiality

California Health and Safety Codes 103875, 103885, and 100330 mandate the California Department of Health Services (CDHS) to collect, protect, and utilize confidential cancer data for research into the causes and control of cancer. The confidentiality of all cancer patients was strictly maintained throughout the study.

Medi-Cal Enrollment Files

Medi-Cal enrollment files for 1993 for all women age 30 and over were obtained from the CDHS Medical Care Statistics Section (MCSS). Files were restricted to women age 30 and over since only 0.6 percent of breast cancers occur before this age. A woman was included on the enrollment files if she was covered by Medi-Cal at any time during the 1993 calendar year, whether or not a claim was submitted for medical services. Information was not available on women who would have met the eligibility criteria for Medi-Cal, but did not apply.

The enrollment files listed a woman once for each month during which she was covered by Medi-Cal, with information on Medicare coverage during the same month. Personal identifiers on the file included first and last name, date of birth, social security number, and zip code of residence. The files provided by MCSS contained approximately 14 million records. Multiple records for the same woman (for multiple months of enrollment) were initially identified by social security number. Because women were sometimes listed with more than one social security number, the file which had been unduplicated based on social security number was further unduplicated by linking the file with itself using the probabilistic linkage program Automatch (19). Name, date of birth, and zip code of residence were used in the linkage. When a temporary social security number had been assigned to a woman by Medi-Cal (i.e., the last digit was a character) and another record was present for the same woman with a valid social security number, the valid number was retained. Medi-Cal and Medicare enrollment status were consolidated for a woman in the unduplication process, so that information was retained on month-by-month Medi-Cal and Medicare coverage.

The unduplicated file contained 1,415,303 women age 30 and over who were covered by Medi-Cal during at least one month in 1993. Because the vast majority of women age 65 and older on Medi-Cal were also covered by Medicare, the study was restricted to women age 30 to 64 years old. Among the 904,201 women 30 to 64 years old covered by Medi-Cal, 74,512 (8.2 percent) were covered by Medicare during each month they were covered by Medi-Cal, and another 11,739 (1.3 percent) were eligible for Medicare at some point during the year. Because Medicare breast cancer screening benefits are different from those of Medi-Cal, women with any Medicare coverage were excluded from the Medi-Cal cohort.

The final unduplicated Medi-Cal enrollment file, therefore, included 817,950 women aged 30 to 64 years old who were enrolled in Medi-Cal during at least one month in 1993 and were not covered by Medicare at any time in 1993. These women accounted for 12 percent of the California female population in this age group in 1993.

Nearly 820,000 women age 30 to 64 had Medi-Cal benefits in 1993, or 12 percent of all California women in this age group in 1993.

Breast Cancer Case Ascertainment

All women newly diagnosed with *in situ* or invasive breast cancer during 1993 and reported to the CCR as of April 1996 were included in the linkage. The CCR is a statewide, population-based cancer registry which has been mandated by law since 1985; statewide reporting was fully implemented in 1988 with standardized data collection and quality control procedures (20). Case reporting was estimated to be virtually complete for 1993 (21). The CCR contains personal identifiers, including first and last name, date of birth, social security number, and address of residence at diagnosis, as well as detailed information on tumor characteristics, date of diagnosis, and extent of disease at diagnosis. Source of payment for medical services and health care coverage were not collected by the CCR in 1993.

Linkage

The Medi-Cal status of all breast cancer cases diagnosed in 1993 was determined by linking the unduplicated 1993 Medi-Cal enrollment file with cases of female breast cancer on the CCR, using Automatch (19). First name, last name, date of birth, social security number, and zip code of residence were used in the linkage process. Of breast cancer cases matched to women on the Medi-Cal enrollment file, 45 percent were an exact match on all fields and 22 percent were exact matches on name, date of birth, and social security number, but not zip code. The remaining 33 percent of matches were not exact on one or more fields, but were assigned a high enough probability score by Automatch to be considered matches or were visually reviewed and considered matches. Altogether, 92 percent of matches were exact on date of birth, 87 percent were exact on social security number, and 85 percent were exact on first and last name.

The Medi-Cal enrollment file was linked to all women diagnosed with breast cancer in 1993 on the CCR.

Months of Medi-Cal Benefits

Medi-Cal enrollment files obtained from MCSS did not provide the basis for Medi-Cal benefits or identify women whose coverage was on a share-of-cost basis only (i.e., not part of cash grants through such programs as Aid to Families with Dependent Children). A suspected or identified breast problem may itself motivate a woman to apply for Medi-Cal benefits or allow her to qualify, and this may vary by extent of disease. Women who were covered by Medi-Cal during the entire calendar year in which they were diagnosed were judged to be the least likely to have obtained Medi-Cal benefits for a breast-related problem. Analyses were therefore conducted separately for women covered by Medi-Cal for the entire calendar year, and those with benefits for less than the entire year. Of the 817,950 women 30 to 64 years old with Medi-Cal benefits in 1993, 481,091 (58.8 percent) were covered by Medi-Cal for the entire year. Women who had Medi-Cal benefits for less than a year were covered for an average of six months.

Among women on Medi-Cal, nearly 60 percent had benefits for the entire year.

Extent of Disease at Diagnosis

Extent of disease at diagnosis can be defined and summarized in a number of ways. The most general scheme, Surveillance, Epidemiology, and End Results (SEER) summary stage, was developed by the SEER program of the National Cancer Institute,

and is based on the extent to which the tumor has spread into other tissues. *In situ* tumors are malignant, but have not yet extended through the first layer of cells surrounding the duct in which it is growing; localized tumors have invaded the basement membrane, but are still confined to the breast when diagnosed; regional and distant tumors have already spread beyond the breast itself to lymph nodes, adjacent tissues, or other organs (22). When breast cancers were grouped as early- and late-stage for this study, early-stage included *in situ* and localized tumors, and late-stage were regional or distant tumors.

Late-stage tumors have spread beyond the breast when diagnosed.

The CCR also collects tumor size (largest diameter in centimeters) and number of regional lymph nodes with pathological evidence of cancer as part of the SEER Extent of Disease (EOD) fields (23). Among tumors confined to the breast, smaller tumors have a better prognosis. For tumors with lymph node involvement, prognosis is better for those with fewer lymph nodes with evidence of cancer.

Tumor size, lymph node involvement, and spread to other organs were used to summarize stage at diagnosis consistent with the classification scheme developed by the American Joint Committee on Cancer (AJCC)(24,25), which is widely used in clinical settings. Conversion of EOD fields to AJCC summary stage was accomplished through the computer program AJCCSTAGE, which was developed by and is available from SEER. This classification is as follows: Stage 0 are *in situ* tumors; Stage I are small (less than two centimeters) tumors with no lymph node involvement; Stage IIa include both small tumors with positive lymph nodes or medium size (two to less than five centimeters) tumors with no lymph node involvement; Stage IIb include both medium size tumors with positive lymph nodes or large (greater than five centimeters) tumors with no lymph node involvement; Stage III are large tumors with positive lymph nodes or any size tumor where lymph nodes are fixed to each other or other structures; and, Stage IV are any tumors with evidence of spread beyond the breast and regional lymph nodes.

Socioeconomic Status and Urban/Rural Residence

The CCR does not collect information on the patient's education or income. Therefore, indicators of socioeconomic status were based on aggregate measures from the 1990 Census for the neighborhood of residence at diagnosis. Neighborhood was defined as the census block group, which contains an average of 1,000 individuals. The assignment of individual income and education based on neighborhood values has been validated (26) and is widely used in epidemiologic studies (27).

Residential addresses at diagnosis reported to the CCR were assigned to a census block group (geocoded) by a commercial vendor. A small percentage of breast cancers included in this study could not be geocoded, the vast majority because the reported address at diagnosis was unknown, or was a post office box or rural route. The proportion of addresses that could not be assigned to census block group was 3.5, 3.3, and 3.4 percent among women with Medi-Cal benefits for 12 months, less than twelve months, and no Medi-Cal coverage during 1993, respectively. These cases were randomly assigned to a census block group within the county of residence at diagnosis.

Data from the 1990 census on education and income for census block groups in California were obtained from the California Department of Finance, Demographic Research Unit. Cases whose residence at diagnosis was a census block group where 25 percent or more of residents age 25 and older did not have a high school degree were categorized as living in a neighborhood with low educational level. Cases whose residence at diagnosis was a census block group with 20 percent or more of the population living at or below 200 percent of the federal poverty level were categorized as living in a poor neighborhood. Women from counties with 90 percent or more of the 1990 Census population living in urban areas were considered urban.

Data Analysis

The following three dichotomous outcomes of interest were examined: 1) the proportion of all breast cancers diagnosed at late stage, 2) the proportion of all localized breast cancers which were two centimeters or larger in largest dimension, excluding tumors of unknown size, and 3) the proportion of all regional breast cancers with four or more positive lymph nodes, excluding cases where lymph nodes were not examined pathologically. The reference group in all models was women with breast cancer not covered by Medi-Cal during any month in 1993, and the two comparison groups were women with breast cancer covered by Medi-Cal for the entire calendar year and those covered for only part of the year.

Measures of advanced disease

- proportion of late-stage tumors
- proportion of localized tumors two centimeters or larger
- proportion of regional tumors with four or more lymph nodes involved

Advanced disease measures among women not on Medi-Cal were compared to those for

- women with Medi-Cal benefits for all of 1993
- women with Medi-Cal for less than 12 months in 1993

Proportional incidence ratios (PIRs) for the three measures of advanced breast disease were calculated using log-binomial regression (28) to control for differences in age, race/ethnicity, marital status, and education. All analyses were conducted using PROC GENMOD in SAS (29). Income and urban/rural residence were not statistically significant, and did not change the effect measures of interest when education was already included in the models, and were not included in the final models. Interaction terms for race/ethnicity and Medi-Cal status were included in all models.

In the analysis of late-stage disease, age was divided into three categories (30-39, 40-49, and 50-64) and race/ethnicity into

If 60 percent of Medi-Cal women with breast cancer had advanced disease, and 40 percent of non-Medi-Cal women, the PIR would be 1.50 (60/40 = 1.50).

four mutually exclusive race/ethnic groups (non-Hispanic white, African American, Hispanic (any race), and Asian). Women of other or unknown race/ethnicity were excluded from all analyses. Marital status was divided into two groups, excluding those of unknown marital status; married and not currently married (single, divorced, separated, or widowed). Because analyses of tumor size and lymph node involvement were restricted to a single stage and, thus, had a smaller number of cases, race/ethnicity in these analyses was divided into non-Hispanic white/others, and age into two categories (30-49, 50-64).

Estrogen receptors are proteins on the cell surface that bind with estrogen. Breast cancers that do not have estrogen receptors (that is, are estrogen receptor negative) are often more aggressive and grow more quickly. Since the causes of estrogen receptor status are not clearly understood, evaluations of tumor size or lymph node involvement should control for estrogen receptor status. Estrogen receptor status is reported to the CCR, but is incompletely ascertained. The percent of breast cancer cases in this study with known estrogen receptor status among *in situ*, localized, regional, and distant tumors was 17, 72, 77, and 50 percent, respectively. Given the large proportion of cases with unknown estrogen receptor status, estrogen receptor status was only included in models of tumor size and lymph node involvement. In models for the subset of women with known estrogen receptor status, Medi-Cal women were combined into one category.

RESULTS

A total of 10,746 *in situ* and invasive breast cancers were diagnosed in 1993 among California women 30 to 64 years old and reported to the CCR as of April 1996. Of these, 867 (8.1 percent) were diagnosed in women who were covered by Medi-Cal at some time during the year, and were not on Medicare. The percent of breast cancers microscopically confirmed was 99.5 among women not covered by Medi-Cal, and 98.8 among women on Medi-Cal. A total of 164 women (152 not on Medi-Cal, 12 on Medi-Cal) were of other (Pacific Islander, American Indian, or unspecified) or unknown race/ethnicity, and were excluded from analyses so that meaningful race-specific comparisons could be made.

Of the 10,582 breast cancers included in the study, 429 were diagnosed among women covered by Medi-Cal during the entire calendar year, and 426 among women covered by Medi-Cal during only part of 1993 (Table 1). The remaining 9,727 cases occurred among women who either did not have Medi-Cal benefits during any month of the year (9,541, 98.1 percent), or had benefits in conjunction with Medicare (186, 1.9 percent); these women will be referred to as "not covered by Medi-Cal" or "non-Medi-Cal women." The number of women with multiple primary breast cancers was 1.8 percent among non-Medi-Cal women, and 1.3 percent among Medi-Cal recipients.

The three groups differed substantially by race/ethnicity, age, marital status, income, and education (Table 1). Women on Medi-Cal were more likely to be African American or Hispanic, to live in neighborhoods with low income and education levels, and were more likely to be young and not currently married than non-Medi-Cal women. However, Medi-Cal and non-Medi-Cal women were equally likely to live in urban counties.

Diagnosis in Relation to Medi-Cal Enrollment

Since only breast cancers diagnosed in 1993 were included in the study, all 429 women who were on Medi-Cal for the entire 1993 calendar year had Medi-Cal benefits prior to and/or during the month they were diagnosed. Among the 426 women on Medi-Cal who did not have benefits for the entire calendar year in 1993, 159 (37 percent) had benefits in 1993 prior to their breast cancer diagnosis, 135 (32 percent) obtained benefits for the first time in 1993 during the month of diagnosis, and 132 (31 percent) obtained benefits for the first time in 1993, one or more months following diagnosis. Among the 132 women on Medi-Cal who obtained benefits for the first time in 1993, following their diagnosis of breast cancer, the delay between diagnosis and Medi-Cal coverage was one to two months for 74 (56 percent) women, three to five months for 35 (27 percent) women, and six or more months for 23 (17 percent) women. Combining all women on Medi-Cal who were diagnosed with breast cancer in 1993, 723 (85 percent) had Medi-Cal benefits prior to or during the month of diagnosis.

Table 1: Demographic and Socioeconomic Characteristics of Women 30 to 64 Years Old Diagnosed With Breast Cancer[1] by Medi-Cal Status, California, 1993

	1993 Medi-Cal Status					
	Not on Medi-Cal[2]		Covered 12 Months		Covered 1-11 Months	
	N	(%)	N	(%)	N	(%)
Total	9,727	100	429	100	426	100
Race/Ethnicity						
Non-Hispanic White	7,319	75.2	186	43.4	172	40.4
African American	605	6.2	94	21.9	52	12.2
Hispanic	1,080	11.1	113	26.3	158	37.1
Asian	723	7.4	36	8.4	44	10.3
Age at Diagnosis (Years)						
30-39	929	9.6	85	19.8	94	22.1
40-49	3,191	32.8	145	33.8	155	36.4
50-64	5,607	57.6	199	46.4	177	41.5
Marital Status						
Not married	3,078	31.6	263	61.3	206	48.4
Married	6,455	66.4	148	34.5	202	47.4
Unknown	194	2.0	18	4.2	18	4.2
Urban/Rural Residence						
Urban[3]	7,639	78.5	323	75.3	316	74.2
Rural	2,088	21.5	106	24.7	110	25.8
Income						
Low[4]	3,987	41.0	363	84.6	342	80.3
Not Low	5,740	59.0	66	15.4	84	19.7
Education						
Low[5]	2,321	23.9	273	63.6	258	60.6
Not Low	7,406	76.1	156	36.4	168	39.4

[1] Excludes women of other or unknown race/ethnicity.
[2] No Medi-Cal benefits in 1993 or covered by Medi-Cal in conjunction with Medicare.
[3] Residence at diagnosis in a county with 90 percent or more of the 1990 Census population in urban areas.
[4] Residence at diagnosis in a census block group with 20 percent or more of the population at or below 200% of the federal poverty level in the 1990 census.
[5] Residence at diagnosis in a census block group with 25 percent or more of adults age 25 and older without a high school degree in the 1990 census.
Prepared by California Department of Health Services, Cancer Surveillance Section.

Unadjusted Analyses

Non-Medi-Cal women with breast cancer had the highest proportion (14.1 percent) of tumors diagnosed at the earliest, *in situ*, stage, compared to 9.3 percent of those among women on Medi-Cal for twelve months, and 5.2 percent among women on Medi-Cal for part of the year (Table 2, Figure 4). Conversely, the proportion of breast cancers that had already spread to other parts of the body when diagnosed was 3.4 percent among non-Medi-Cal women, 7.0 percent among women on Medi-Cal for twelve months, and 18.1 percent among women on Medi-Cal for only part of the year.

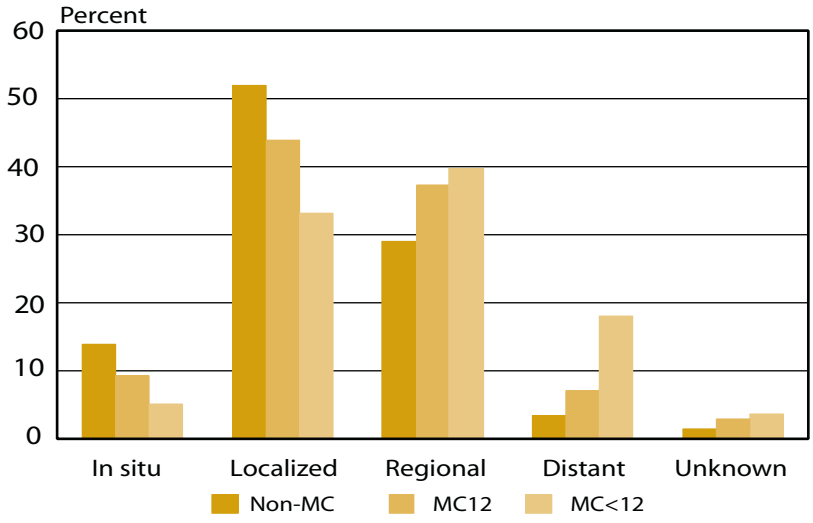
Table 2: Summary Stage at Diagnosis Among Women 30 to 64 Years Old Diagnosed with Breast Cancer[1] by Medi-Cal Status, California, 1993

	1993 Medi-Cal Status					
	Not on Medi-Cal[2]		Covered 12 Months		Covered 1-11 Months	
	N	(%)	N	(%)	N	(%)
Total	9,752	100	429	100	426	100
SEER Summary Stage[3]						
In situ	1,370	14.1	40	9.3	22	5.2
Localized	5,055	52.0	188	43.8	142	33.3
Regional	2,825	29.0	159	37.1	169	39.7
Distant	331	3.4	30	7.0	77	18.1
Unknown	146	1.5	12	2.8	16	3.8
AJCC Summary Stage[4]						
0 (*in situ*)	1,370	14.1	40	9.3	22	5.2
I (< 2 cm LNN)	3,501	36.0	99	23.1	72	16.9
IIa (< 2 cm LNP or 2-5 cm LNN)	2,131	21.9	112	26.1	87	20.4
IIb (2-5 cm LNP or > 5 cm LNN)	1,192	12.3	85	19.8	68	16.0
II NOS	135	1.4	2	0.5	9	2.1
III (> 5 cm LNP or any size LNF)	480	4.9	31	7.2	57	13.4
IV (other organs)	317	3.3	28	6.5	75	17.6
Unknown	602	6.2	32	7.5	36	8.5

[1] Excludes women of other or unknown race/ethnicity.
[2] No Medi-Cal benefits in 1993 or covered by Medi-Cal in conjunction with Medicare.
[3] SEER Summary Staging Guide, 1977.
[4] AJCC Manual for Staging of Cancer, 3rd edition, converted from SEER Extent of Disease fields.

SEER: Surveillance, Epidemiology, and End Results program, National Cancer Institute; AJCC: American Joint Commission on Cancer; LNN: lymph nodes negative; LNP: lymph nodes positive; LNF: lymph nodes fixed to each other or other structures; NOS: not otherwise specified.
Prepared by California Department of Health Services, Cancer Surveillance Section.

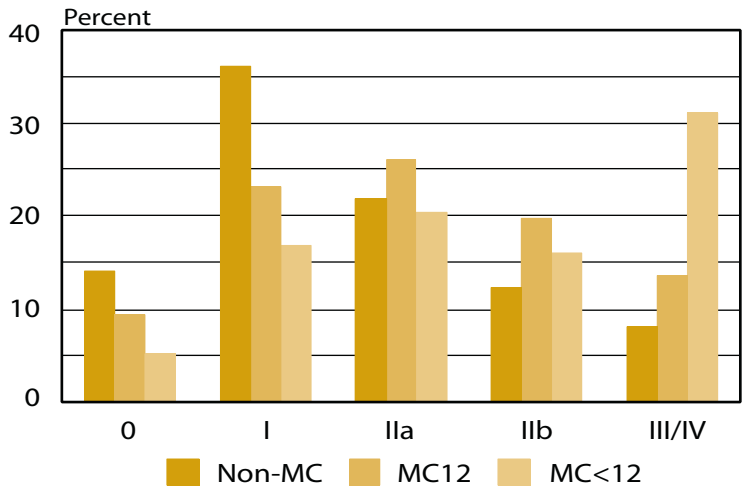
Figure 4: SEER Summary Stage at Diagnosis for Breast Cancers Among Women 30 to 64 Years Old by Medi-Cal Status, California, 1993



Non-MC: Not covered by Medi-Cal in 1993; MC12: covered by Medi-Cal for the entire 1993 calendar year; MC<12: covered by Medi-Cal for only part of 1993. Prepared by CDHS/CSS.

Examining stage at diagnosis by American Joint Commission on Cancer (AJCC) summary stage, 36.0 percent of tumors diagnosed among women not covered by Medi-Cal were classified as Stage I (invasive but less than two cm without any lymph node involvement), compared to 23.1 percent among women on Medi-Cal for twelve months, and 16.9 percent among women on Medi-Cal for only part of the year (Table 2, Figure 5). Over 30 percent of breast cancers among women on Medi-Cal for only part of the year were Stage III or IV, twice the proportion among women on Medi-Cal for the entire year (13.7 percent), and nearly four times the proportion among women not on Medi-Cal (8.2 percent).

Figure 5: AJCC Summary Stage at Diagnosis for Breast Cancers Among Women 30 to 64 Years Old by Medi-Cal Status, California, 1993



Non-MC: Not covered by Medi-Cal in 1993; MC12: covered by Medi-Cal for the entire 1993 calendar year; MC<12: covered by Medi-Cal for only part of 1993. Prepared by CDHS/CSS.

Among women with localized disease, women on Medi-Cal were more likely to have large tumors, which have a poorer prognosis (Table 3A, Figure 6). Among women not on Medi-Cal, 21.4 percent of localized tumors were very small (less than one cm), compared to 13.3 percent among women on Medi-Cal for the entire calendar year, and only 9.9 percent among women on Medi-Cal for less than a year.

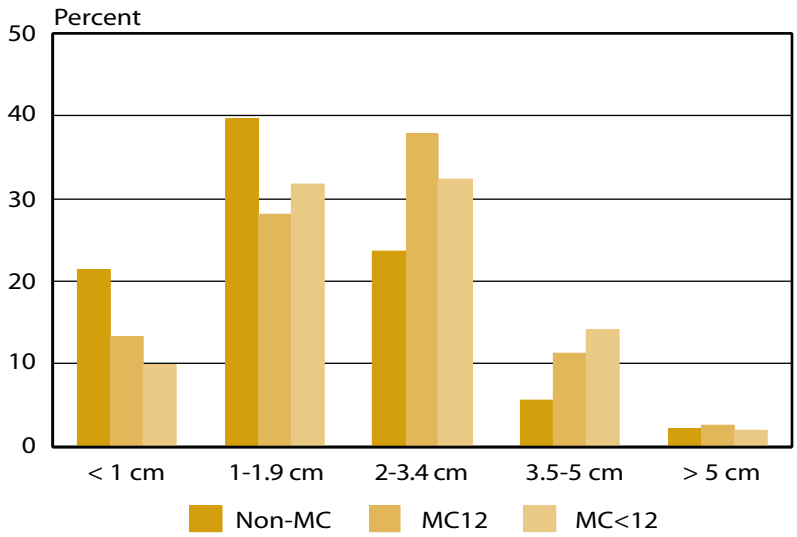
Similarly, women on Medi-Cal with localized disease were more likely to have estrogen receptor negative tumors, which are associated with more rapid growth. Among cancers with known estrogen receptor status, the percent of estrogen receptor negative tumors was 31.4, 39.4, and 46.9 among non-Medi-Cal women, women on Medi-Cal for the entire year, and women on Medi-Cal for less than a year, respectively (Table 3B).

Table 3: Tumor Size at Diagnosis and Estrogen Receptor Protein Status Among Women 30 to 64 Years Old Diagnosed with Localized Breast Cancer[1] by Medi-Cal Status, California, 1993

	1993 Medi-Cal Status					
	Not on Medi-Cal[2]		Covered 12 Months		Covered 1-11 Months	
	N	(%)	N	(%)	N	(%)
A. Tumor Size						
Less than 1.0 cm	1,083	21.4	25	13.3	14	9.9
1.0 cm - 1.9 cm	1,999	39.6	53	28.2	45	31.7
2.0 cm - 3.4 cm	1,196	23.7	71	37.8	46	32.4
3.5 cm - 5.0 cm	288	5.7	21	11.2	20	14.1
Greater than 5 cm	115	2.3	5	2.7	3	2.1
Unknown	374	7.4	13	6.9	14	9.8
Total	5,055	100	188	100	142	100
B. Estrogen Receptor Status[3]						
Positive	2,485	67.6	73	57.5	42	51.9
Negative	1,155	31.4	50	39.4	38	46.9
Borderline	34	0.9	4	3.2	1	1.2
Total	3,674	100	127	100	81	100

[1] Excludes women of other or unknown race/ethnicity.
[2] No Medi-Cal benefits in 1993 or covered by Medi-Cal in conjunction with Medicare.
[3] Excludes tumors of unknown estrogen receptor status.
Prepared by California Department of Health Services, Cancer Surveillance Section.

Figure 6: Tumor Size Among Women 30 to 64 Years Old with Localized Breast Cancer by Medi-Cal Status, California, 1993



Non-MC: Not covered by Medi-Cal in 1993; MC12: covered by Medi-Cal for the entire 1993 calendar year; MC<12: covered by Medi-Cal for only part of 1993. Prepared by CDHS/CSS.

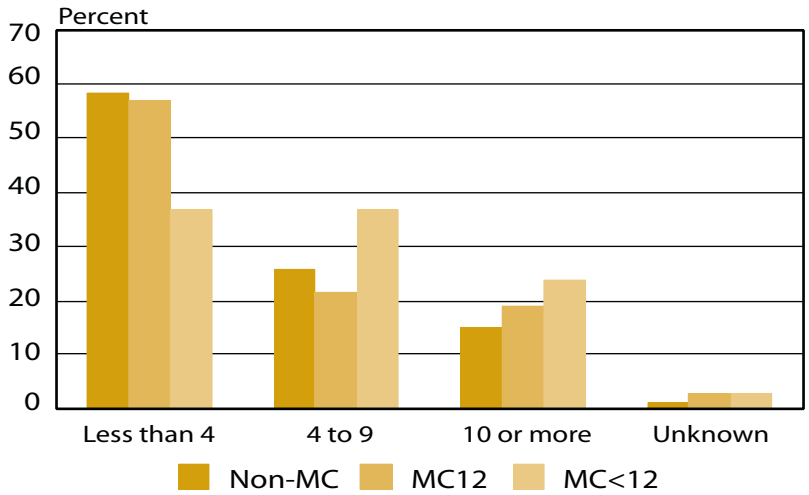
Table 4: Number of Regional Lymph Nodes with Pathological Evidence of Cancer and Estrogen Receptor Protein Status Among Women 30 to 64 Years Old Diagnosed with Regional Breast Cancer[1] by Medi-Cal Status, California, 1993

	1993 Medi-Cal Status					
	Not on Medi-Cal[2]		Covered 12 Months		Covered 1-11 Months	
	N	(%)	N	(%)	N	(%)
A. Number of Positive Regional Lymph Nodes						
3 or fewer	1,541	58.2	82	56.9	52	36.6
4-9	680	25.7	31	21.5	52	36.6
10 or more	401	15.1	27	18.8	34	23.9
Unknown	28	1.1	4	2.8	4	2.8
Total	2,650	100	144	100	142	100
B. Estrogen Receptor Status[3]						
Positive	1,476	67.2	69	63.3	54	52.4
Negative	698	31.8	38	34.9	48	46.6
Borderline	21	1.0	2	1.8	1	1.0
Total	2,195	100	109	100	103	100

[1] Excludes women of other or unknown race/ethnicity and those who did not have regional lymph nodes examined pathologically.
[2] No Medi-Cal benefits in 1993 or covered by Medi-Cal in conjunction with Medicare.
[3] Excludes tumors with unknown estrogen receptor status.
Prepared by California Department of Health Services, Cancer Surveillance Section.

Among women with regional disease, women on Medi-Cal, especially those on Medi-Cal for only part of the year, were likely to have more lymph nodes with pathological evidence of cancer, which is, again, an indicator of poorer prognosis (Table 4A, Figure 7). As seen with localized disease, women on Medi-Cal with regional disease were also more likely to have estrogen receptor negative tumors. Among regional tumors with known estrogen receptor status, the percent of estrogen receptor negative tumors was 31.8, 34.9, and 46.6 among non-Medi-Cal women, women on Medi-Cal for the entire year, and women on Medi-Cal for less than a year, respectively (Table 4B).

Figure 7: Number of Lymph Nodes with Cancer Among Women 30 to 64 Years Old with Regional Breast Cancer by Medi-Cal Status, California, 1993



Non-MC: Not covered by Medi-Cal in 1993; MC12: covered by Medi-Cal for the entire 1993 calendar year; MC<12: covered by Medi-Cal for only part of 1993. Prepared by CDHS/CSS.

Overall, the unadjusted proportion of breast cancers diagnosed at late stage (regional or distant) was 32.4 percent among women not on Medi-Cal, 44.1 percent among women on Medi-Cal for the entire calendar year, and 57.8 percent among women on Medi-Cal for only part of the year (Table 5). The proportion of breast cancers diagnosed at late stage was higher for women covered by Medi-Cal for the calendar year than for those not covered by Medi-Cal, and highest among women on Medi-Cal for only part of the year, in each age and marital group, and regardless of urban/rural residence, income, or education level (Table 5).

Table 5: Percent of Breast Cancers Diagnosed at Late Stage[1] Among Women 30 to 64 Years Old[2] by Demographic and Socioeconomic Characteristics and Medi-Cal Status, California, 1993

	1993 Medi-Cal Status		
	Not on Medi-Cal[3]	Covered 12 Months	Covered 1-11 Months
Total	32.5	44.1	57.8
Race/Ethnicity			
Non-Hispanic White	31.4	41.4	58.1
African American	34.9	48.9	55.8
Hispanic	39.9	40.7	63.3
Asian	30.2	55.6	38.6
Age at Diagnosis (Years)			
30-39	41.4	45.9	63.8
40-49	33.9	47.6	54.2
50-64	30.2	40.7	57.6
Marital Status			
Not married	33.6	45.3	59.7
Married	32.0	43.9	57.9
Unknown	27.3	27.8	33.3
Urban/Rural Residence			
Urban[4]	32.4	46.1	57.6
Rural	32.6	37.7	58.2
Income			
Low[5]	34.5	45.5	58.2
Not Low	31.1	43.8	56.0
Education			
Low[6]	36.8	44.0	62.8
Not Low	31.1	44.2	50.0

[1] Late-stage breast cancer is defined as having spread beyond the breast (regional or distant disease) at the time of diagnosis.
[2] Excludes women of other or unknown race/ethnicity.
[3] No Medi-Cal benefits in 1993 or covered by Medi-Cal in conjunction with Medicare.
[4] Residence at diagnosis in a county with 90 percent or more of the 1990 Census population in urban areas.
[5] Residence at diagnosis in a census block group with 20 percent or more of the population at or below 200% of the federal poverty level in the 1990 census.
[6] Residence at diagnosis in a census block group with 25 percent or more of adults age 25 and older without a high school degree in the 1990 census.

Prepared by California Department of Health Services, Cancer Surveillance Section.

Adjusted Analyses

As can be seen by examining Table 5, the proportion of breast cancers diagnosed at late stage is higher among African American and Hispanic women, among young and unmarried women, and among women from poor and less educated neighborhoods, even among women not covered by Medi-Cal. Since a higher proportion of women on Medi-Cal have these same characteristics (Table 1), it is important to control for these factors in assessing the independent contribution of Medi-Cal status to an increase in the proportion of late-stage disease. Controlling for factors other than Medi-Cal status allows the following hypothetical question to be answered: "If the proportion of woman with risk factors for late-stage breast cancer, other than Medi-Cal status, was the same among Medi-Cal and non-Medi-Cal women, would women with Medi-Cal benefits still have a higher proportion of late-stage disease?"

Interpretation of PIRs

An adjusted PIR of 1.50 means that among women with breast cancer, those with Medi-Cal benefits were 50 percent more likely than other women to be diagnosed with advanced disease, even after controlling for factors other than Medi-Cal status that also affect stage at diagnosis.

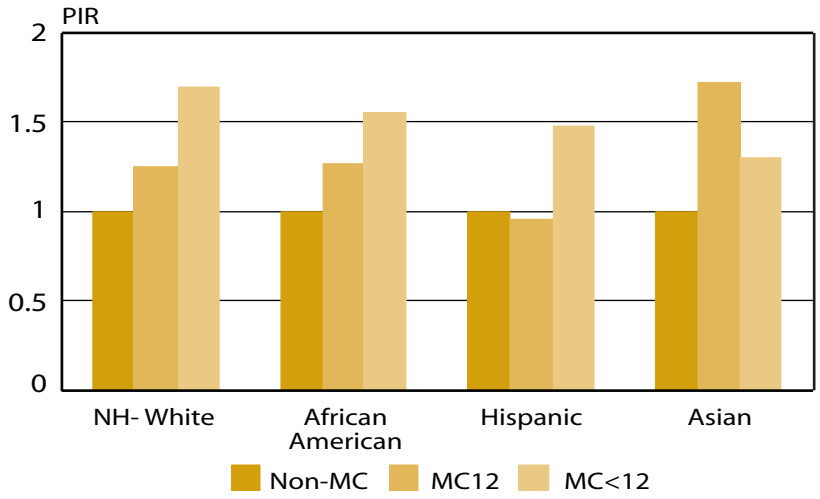
In this study, multiple risk factors were controlled for at the same time through statistical modelling with log-binomial regression. The outcome measure was the adjusted proportional incidence ratio (PIR). The adjusted PIR was greater than 1.00 if Medi-Cal women had a higher proportion of late-stage disease after controlling for race/ethnicity, age, marital status, education, and in some models, estrogen receptor status. For example, an adjusted PIR of 1.50 would mean that among women with breast cancer, those with Medi-Cal benefits were 50 percent more likely than other women to be diagnosed at late stage, even after controlling for factors other than Medi-Cal status known to increase the risk for advanced disease. If the 95 percent confidence interval for the adjusted PIR includes the value of 1.00, the difference between the two groups being compared is not statistically significant. That is, there is a 5 percent chance that the difference occurred due to normal (random) fluctuations in the outcome being studied.

Interpretation of 95 percent confidence intervals

If a 95 percent confidence interval includes the value of 1.00, the difference between the two groups being compared is not statistically significant. That is, there is a 5 percent chance that the difference occurred due to normal (random) fluctuations in the outcome being studied.

In adjusted analyses, women on Medi-Cal for twelve months were at least 25 percent more likely to have been diagnosed with late-stage disease than non-Medi-Cal women of the same race/ethnicity, except among Hispanic women, and the increase in risk was statistically significant (Table 6A, Figure 8). Women on Medi-Cal for less than twelve months were from 30-70 percent more likely to have been diagnosed with late-stage disease than non-Medi-Cal women of the same race/ethnicity; the difference was statistically significant except among Asian women (Table 6A, Figure 8).

Figure 8: Adjusted Proportional Incidence Ratios (PIR) for Late-Stage Breast Cancer Among Women 30 to 64 Years Old by Medi-Cal Status, California, 1993



Non-MC: Not covered by Medi-Cal in 1993; MC12: covered by Medi-Cal for the entire 1993calendar year; MC<12: covered by Medi-Cal for only part of 1993. Adjusted for race/ethnicity, age, marital status, and neighborhood education, log-binomial regression.
Prepared by CDHS/CSS.

Table 6: Adjusted Proportional Incidence Ratios[1] (95% Confidence Intervals) for Advanced Disease Among Women 30 to 64 Years Old Diagnosed With Breast Cancer[2] by Medi-Cal Status, California, 1993

	1993 Medi-Cal Status		
	Not on Medi-Cal[3]	Covered 12 Months	Covered 1-11 Months
A. Late-Stage Disease[4]			
Non-Hispanic White	1.0 (ref)	1.25 (1.05, 1.49)	1.70 (1.49, 1.94)
African American	1.0 (ref)	1.27 (1.00, 1.60)	1.56 (1.20, 2.01)
Hispanic	1.0 (ref)	0.96 (0.75, 1.21)	1.48 (1.29, 1.70)
Asian	1.0 (ref)	1.72 (1.27, 2.33)	1.30 (0.89, 1.91)
B. Localized Tumors 2 cm or Larger[5]			
Non-Hispanic White	1.0 (ref)	1.51 (1.21, 1.88)	1.43 (1.07, 1.92)
African American, Hispanic, Asian	1.0 (ref)	1.20 (0.99, 1.44)	1.17 (0.95, 1.43)
C. Regional Disease with 4 or More Positive Lymph Nodes[6]			
Non-Hispanic White	1.0 (ref)	1.24 (0.97, 1.59)	1.39 (1.09, 1.78)
African American, Hispanic, Asian	1.0 (ref)	0.75 (0.53, 1.05)	1.47 (1.21, 1.76)

[1] Adjusted for race/ethnicity, age, marital status, and education, log-binomial regression. Reference group (ref) is women not on Medi-Cal.
[2] Excludes women of other or unknown race/ethnicity and unknown marital status.
[3] No Medi-Cal benefits in 1993 or covered by Medi-Cal in conjunction with Medicare.
[4] Late-stage breast cancer is defined as having spread beyond the breast (regional or distant disease) at the time of diagnosis.
[5] Excludes localized tumors of unknown size.
[6] Excludes regional tumors that were not examined pathologically.
Prepared by California Department of Health Services, Cancer Surveillance Section.

In analyses of tumor size which did not include estrogen receptor status in the model, non-Hispanic white women with localized tumors were significantly more likely to have large (at least two cm) tumors if they were covered by Medi-Cal for either the entire year or part of the year, and the PIRs for the two Medi-Cal groups were very similar (1.51 and 1.43, respectively)(Table 6B). Women of color with localized disease were also more likely to have large tumors if they were covered by Medi-Cal, and the increase in risk was similar regardless of number of months on Medi-Cal; however, the PIRs were not statistically significant.

When estrogen receptor status was added to the model and data were reanalyzed for the subset of women for whom estrogen receptor status was known (72 percent of women with localized disease), and women covered by Medi-Cal were combined into one group, estrogen receptor negative tumors had a significantly higher proportion of large tumors than estrogen receptor positive or borderline tumors (PIR=1.38, 95 percent confidence interval 1.27, 1.50), controlling for all other factors in the model (data not shown). However, even after controlling for estrogen receptor status, women on Medi-Cal were still significantly more likely to be diagnosed with large tumors, whether non-Hispanic white or women of color (Table 7).

Among women with regional disease, women on Medi-Cal for less than twelve months were 40 to 50 percent more likely than women not on Medi-Cal to have four or more lymph nodes involved, and the increase in risk was statistically significant for both non-Hispanic white women and women of color (Table 6C). When estrogen receptor status was added to the model and data were reanalyzed for the subset of women for whom estrogen receptor status was known (77 percent of women with regional disease), and combining all women covered by Medi-Cal into one group, estrogen receptor status was not significantly associated with having four or more lymph nodes involved, and did not affect the relationship between Medi-Cal status and advanced disease (data not shown).

Table 7: Adjusted Proportional Incidence Ratios[1] (95% Confidence Intervals) for Large Tumors Among Women 30 to 64 Years Old Diagnosed with Localized Breast Cancer[2] by Medi-Cal Status, California, 1993

	1993 Medi-Cal Status	
	Not on Medi-Cal[3]	At Least One Month
Non-Hispanic White	1.0 (ref)	1.46 (1.19, 1.78)
African American, Hispanic, Asian	1.0 (ref)	1.21 (1.02, 1.43)

1 Adjusted for race/ethnicity, age, marital status, education, and estrogen receptor status, log-binomial regression. Reference group (ref) is women not on Medi-Cal.
2 Excludes women of other or unknown race/ethnicity, unknown marital status, unknown tumor size, and unknown estrogen receptor status.
3 No Medi-Cal benefits in 1993 or covered by Medi-Cal in conjunction with Medicare.
Prepared by California Department of Health Services, Cancer Surveillance Section.

DISCUSSION

This unique linkage of Medi-Cal enrollment files and population-based cancer incidence data from the CCR demonstrates that women on Medi-Cal who develop breast cancer are more likely to be diagnosed with advanced disease than women not covered by Medi-Cal. Non-Hispanic white, African American, and Asian women who were covered by Medi-Cal during the entire calendar year in which they were diagnosed were significantly more likely to present with late-stage disease than women of the same race/ethnicity not covered by Medi-Cal after controlling for differences in age, marital status, and education. In addition, women on Medi-Cal with localized disease were more likely to have tumors two centimeters or larger in size than women not covered by Medi-Cal, and those with regional disease were more likely to have four or more lymph nodes with evidence of cancer.

Women on Medi-Cal were diagnosed with
- more advanced disease
- larger tumors
- more lymph nodes involved

than other women with breast cancer.

Data from the CCR and other studies have demonstrated that poor women and women of color are more likely to be diagnosed with advanced disease than other women with breast cancer (30-32). However, to our knowledge, this is the first population-based study that has evaluated these outcomes for women who receive health care services through Medi-Cal in California. The results indicate that even though Medi-Cal benefits include mammograms, clinical breast exams, diagnosis, and treatment, thus eliminating cost as a barrier, these women are either not being routinely screened or are not receiving follow-up diagnostic services in a timely manner.

A higher proportion of advanced disease among women covered by Medi-Cal is strong indirect evidence that they are not receiving routine breast cancer screening or are not receiving timely follow-up diagnostic services.

Given the substantial proportion of women receiving health care through Medi-Cal, especially among African American and Hispanic women, public health interventions to reduce breast cancer mortality will have limited impact if they do not address the needs of this underserved population, and the system through which they receive care.

Eight percent of all women and 20 percent of African American and Hispanic women with breast cancer had Medi-Cal benefits.

The only other population-based study of breast cancer stage at diagnosis among Medicaid women was based on cases diagnosed from 1985 to 1987 in New Jersey, before Medicaid benefits were expanded to include screening mammograms (33). It demonstrated that both Medicaid recipients and uninsured women were more likely to be diagnosed with late-stage disease than privately insured women, and had significantly worse survival.

Although the evidence for underutilization of breast cancer screening provided by this study is indirect, it is consistent with the limited data available on breast cancer screening among women on Medicaid, or other forms of public entitlements. Data from telephone surveys of women 52-75 years old in Massachusetts in 1990 showed that among participants with health insurance, women on public entitlements reported the lowest mammography use (34). Data from the 1992 National Health Interview Survey also showed considerably lower mammography utilization among women on Medicaid than other insured women, although some of the difference was explained by factors such as age, race/ethnicity, education, income, marital status and self-reported overall health status (15).

These findings are also consistent with the Commission on Cancer evaluation of treatment of cancer patients diagnosed in 1990 in hospitals with tumor registries affiliated with the American College of Surgeons. Among participating hospitals, women on Medicaid were more likely than other insured women to be diagnosed with late-stage disease, and were less likely to have had a screening mammogram as the first indication of disease (35).

One potential shortcoming of this study was the inability to identify women who qualified for Medi-Cal specifically because of disability or poverty associated with this cancer. However, this study examined diagnosis and Medi-Cal coverage within the same calendar year, and the majority of Medi-Cal recipients (85 percent) were covered by Medi-Cal when diagnosed or prior to diagnosis. In addition, the extent of disease reported to the CCR does not reflect disease progression after diagnosis. However, the overall proportion of women with advanced disease among Medi-Cal recipients may have been increased by women with late-stage disease qualifying for Medi-Cal due to disability or poverty associated with this cancer, especially in the small proportion of cases where Medi-Cal coverage began six or more months after diagnosis (2.7 percent of all cancers among Medi-Cal women). This study was able to partially control for this potential bias by identifying women who were covered by Medi-Cal during the entire calendar year in which they were diagnosed, and analyzing separately those with a full year and less than a full year of benefits.

This study controlled for a number of factors known to be associated with advanced disease other than Medi-Cal status, and which differed between the groups under study, such as age at diagnosis, marital status, race/ethnicity, and to a more limited extent, urban/rural residence, income, education, and estrogen receptor status. Nonetheless, some residual confounding may exist, especially due to the use of neighborhood measures of income and education. It should be remembered, however, that Medi-Cal women are being compared to all other women, which in this age group includes a substantial proportion of uninsured women. If it had been possible to compare women on Medi-Cal to those covered by private insurance, even more substantial differences may have been found.

Hispanic women were the only race/ethnic group evaluated which did not show an increased proportion of late-stage disease among women with Medi-Cal benefits for the entire year, compared to Hispanic women without Medi-Cal benefits. However, among women without Medi-Cal benefits, Hispanic women had the highest proportion of late-stage cancers. The failure to identify a difference in stage at diagnosis between Hispanic women covered by Medi-Cal for the entire year and not covered at all may reflect equally poor screening in both groups. This is consistent with self-reported data showing that Hispanic women in California, especially those who are poor, have the lowest mammography utilization rates (8). In addition, compared to other race/ethnic groups, a higher proportion of Hispanic women on Medi-Cal were covered for only part of the year, and this group had the highest proportion of late-stage tumors.

In most comparisons, women who were on Medi-Cal for only part of the year had the highest proportion of advanced disease. That 18 percent of these women had distant metastases at diagnosis indicates that not only were they not being screened, but they had probably been symptomatic for some time before seeking or being able to obtain medical services. Among women with Medi-Cal benefits for part of the year, 31.1 percent obtained Medi-Cal benefits in 1993 after the month of diagnosis, and another 31.6 percent first obtained benefits in 1993 during the month diagnosed. It is likely that some, or many, of these women were uninsured and not eligible for Medi-Cal as part of welfare benefits, and did not seek Medi-Cal coverage until developing a breast problem. These women may be the hardest group to reach with prevention messages, since they may have little contact with any health care system, including Medi-Cal. Efforts to reach these women through existing state- and federally-funded breast cancer screening programs should be expanded, and obtaining Medi-Cal benefits should be expedited, when needed.

Women with intermittent Medi-Cal coverage had an especially high proportion of late-stage disease.

Different strategies are available to increase breast cancer screening among women who are covered by Medi-Cal prior to developing breast problems, since they are already in a health-care delivery system. It is beyond the scope of this paper to thoroughly review the extensive literature on determinants of adherence to routine breast cancer screening. However, there is substantial evidence that physician recommendations can play an important role, especially when cost is not a primary barrier. In the 1990 National Health Interview Survey, women cited lack of physician recommendation as the single most important reason that they had not had a mammogram (36). Conversely, a random telephone survey of women 50-74 years old found that the most important predictor of having a mammogram in the

Lack of physician recommendation is a top-ranked barrier to breast cancer screening among nearly all women.

previous year was physician recommendation (37). The Wirthlin Health Study demonstrated that although barriers to mammography vary by age, race/ethnicity, and income, lack of recommendation by a provider was a top-ranked barrier for nearly all groups of women (38).

When women who receive health care services through Medi-Cal have contact with providers, even if not related to their own health or breast health specifically, a clinical breast exam and screening mammogram should be recommended if appropriate for the woman's age and prior screening history. The use of reminder systems and nurse counselling to improve breast cancer screening should be explored. The efficacy and feasibility of monetary incentives for physicians to provide a broad range of age and gender appropriate cancer prevention and detection services to their Medi-Cal clients should also be evaluated.

It has also been demonstrated that providing payment benefits for breast cancer screening is more likely to increase mammography utilization when combined with educational interventions directed to clients and providers (39). State- and federally-funded breast cancer intervention programs have developed an extensive array of materials, outreach strategies, and partnerships with underserved communities. Ways to build on these efforts to improve breast cancer screening among women on Medi-Cal should be explored.

Effective client and provider education interventions and community partnerships should be expanded.

Medi-Cal is expanding the number of beneficiaries who receive health care through managed care programs. One of the goals of this change is to increase the utilization of clinical preventive services (40). In 1993, about ten percent of Medi-Cal recipients were in managed care programs (40). This figure had increased to about 30 percent by 1997, and is expected to continue to increase. Although the movement of Medi-Cal recipients into managed care programs is primarily focused on younger women, the success of Medi-Cal managed care in reducing the proportion of breast cancers diagnosed at late stage should be evaluated carefully.

The burden of advanced breast cancer is lower survival among the women it serves and potentially higher treatment costs for the Medi-Cal system.

This study provides strong evidence that women receiving health-care services through Medi-Cal are not being adequately screened for breast cancer, even though Medi-Cal pays for mammograms, or are not receiving timely follow-up after screening. The burden of advanced breast cancer is potentially higher treatment costs for the Medi-Cal system, and lower survival among the women it serves. Strategies must be developed and implemented to improve access to and utilization of breast cancer screening and follow-up services in this underserved population.

REFERENCES

1. Ries LAG, Kosary CL, Hankey BF, Miller BA, Edwards BK. SEER Cancer Statistics Review, 1973-1996. Bethesda, MD: National Cancer Institute, 1999.

2. Andersson I, Aspegren K, Janzon L, et al. Mammographic screening and mortality from breast cancer: the Malmo mammographic screening trial. *Br Med J* 1988; 297(6654):943-8.

3. Tabar L, Fagerberg G, Chen HH, et al. Efficacy of breast cancer screening by age. New results from the Swedish Two-County Trial. *Cancer* 1995; 75(10):2507-17.

4. Frisell J, Eklund G, Hellstrom L, Lidbrink E, Rutqvist LE, Somell A. Randomized study of mammography screening—preliminary report on mortality in the Stockholm trial. *Breast Cancer Res Treat* 1991; 18(1):49-56.

5. Miller AB, Baines CJ, To T, Wall C. Canadian National Breast Screening Study: 2. Breast cancer detection and death rates among women aged 50 to 59 years. *Can Med Assoc J* 1992; 147(10):1477-88.

6. Roberts MM, Alexander FE, Anderson TJ, et al. Edinburgh trial of screening for breast cancer: mortality at seven years. *Lancet* 1990; 335(8684):241-6.

7. Shapiro S, Venet W, Strax P, Venet L. Current results of the breast cancer screening randomized trial: The Health Insurance Plan (HIP) of Greater New York. In: Day NE, Miller AB, eds. Screening for breast cancer. Toronto: H. Huber, 1988; 3-15.

8. Data points: results from the 1997 California Women's Health Survey. Sacramento, CA: California Department of Health Services, Office of Women's Health, 1998.

9. Perkins CI, Kwong SL, Morris CR, Wright WE. Trends in female breast cancer mortality in California, 1973-1994. *J Reg Management* 1996; 23:164-167.

10. Morris CM, Cohen R, Perkins CI, et al. Cancer in California, 1988-1996. Sacramento, CA: California Department of Health Services, Cancer Surveillance Section, 1999.

11. Advance Report: California Vital Statistics, 1997. Sacramento, CA: California Department of Health Services, Office of Vital Records and Statistics, 1999.

12. Rakowski W, Clark MA. Do groups of women aged 50 to 75 match the national average mammography rate? *Am J Prev Med* 1998; 15(3):187-97.

13. Breen A. Every Woman Counts: the Breast Cancer Early Detection program. Sacramento, CA: California Department of Health Services, Cancer Detection Section, 1996.

14. Makuc DM, Fried VM, Parson PE. Health insurance and cancer screening among women. *Advance Data* 1994; 254:1-9.

15. Potosky AL, Breen N, Graubard BI, Parsons PE. The association between health care coverage and the use of cancer screening tests. Results from the 1992 National Health Interview Survey. *Med Care* 1998; 36(3):257-70.

16. Fagerberg G, Baldetorp L, Grontoft O, Lundstrom B, Manson JC, Nordenskjold B. Effects of repeated mammographic screening on breast cancer stage distribution. Results from a randomised study of 92,934 women in a Swedish county. *Acta Radiol Oncol* 1985; 24(6):465-73.

17. Chu KC, Smart CR, Tarone RE. Analysis of breast cancer mortality and stage distribution by age for the Health Insurance Plan clinical trial. *J Natl Cancer Inst* 1988; 80(14):1125-32.

18. Hiatt RA, Tekawa IS. Mammography utilization in relation to stage at diagnosis for breast cancer: the Kaiser Permanente experience in a large pre-paid health plan. *Prog Clin Biol Res* 1990; 339:227-38.

19. Automatch, ed. 4.0. Silver Springs, MD: Matchware Technologies, Inc., 1996.

20. California Cancer Reporting System Standards, Volume One: abstracting and coding procedures for hospitals, fifth edition. Sacramento, CA: California Department of Health Services, California Cancer Registry, Data Standards and Assessment Unit, 1998.

21. Howe HL, Lehnherr M. Cancer in North America, 1989-1993. Volume One: Incidence. North American Association of Central Cancer Registries, 1997.

22. Shambaugh MA, Weiss MA, Ryan RF, Platz CE. SEER summary staging guide. Bethesda, MD: National Cancer Institute, 1977.

23. Shambaugh EM, Ries LG, Young JL, et al. SEER Extent of Disease, 1988: codes and coding instructions. Bethesda, MD: National Cancer Institute, 1992.

24. Beahrs OH, Henson DE, Hutter RVP, Myers MH. Manual for Staging of Cancer. Philadelphia, PA: American Joint Committee on Cancer, 1988.

25. Shambaugh EM, Weiss MA, Ries LAG, et al. Comparative Staging Guide for Cancer. Bethesda, MD: National Cancer Institute, 1993.

26. Krieger N. Overcoming the absence of socioeconomic data in medical records: validation and application of a census-based methodology. *Am J Public Health* 1992; 82(5):703-10.

27. Krieger N, Williams DR, Moss NE. Measuring social class in US public health research: concepts, methodologies, and guidelines. *Annu Rev Public Health* 1997; 18:341-78.

28. Skov T, Deddens J, Petersen MR, Endahl L. Prevalence proportion ratios: estimation and hypothesis testing. *Int J Epidemiol* 1998; 27(1):91-5.

29. SAS, Version 6.12. Cary, NC: SAS Institute, Inc., 1996.

30. Snipes KP. Stage at diagnosis of female breast cancer, 1988-1992. In: Morris CM, Wright WE, eds. Breast cancer in California. Sacramento, CA: California Department of Health Services, Cancer Surveillance Section, 1996.

31. Mandelblatt J, Andrews H, Kerner J, Zauber A, Burnett W. Determinants of late stage diagnosis of breast and cervical cancer: the impact of age, race, social class, and hospital type. *Am J Public Health* 1991; 81(5):646-9.

32. Farley TA, Flannery JT. Late-stage diagnosis of breast cancer in women of lower socioeconomic status: public health implications. *Am J Public Health* 1989; 79(11):1508-12.

33. Ayanian JZ, Kohler BA, Abe T, Epstein AM. The relation between health insurance coverage and clinical outcomes among women with breast cancer. *N Engl J Med* 1993; 329(5):326-31.

34. Zapka JG, Hosmer D, Costanza ME, Harris DR, Stoddard A. Changes in mammography use: economic, need, and service factors. *Am J Public Health* 1992;82(10):1345-51.

35. Osteen RT, Winchester DP, Hussey DH, et al. Insurance coverage of patients with breast cancer in the 1991 commission on cancer patient care evaluation study. *Ann Surg Oncol* 1994; 1(6):462-7.

36. Breen N, Kessler L. Changes in the use of screening mammography: evidence from the 1987 and 1990 National Health Interview Surveys. *Am J Public Health* 1994; 84(1):62-7.

37. Rimer BK, Trock B, Engstrom PF, Lerman C, King E. Why do some women get regular mammograms? *Am J Prev Med* 1991; 7(2):69-74.

38. Harper AP. Mammography utilization in the poor and medically underserved. *Cancer* 1993; 72(4 Suppl):1478-82.

39. Breen N, Feuer EJ, Depuy S, Zapka J. The effect of Medicare reimbursement for screening mammography on utilization and payment. National Cancer Institute Breast Cancer Screening Consortium. *Public Health Rep* 1997; 112(5):423-32.

40. Klein J, Donaldson C. 1998 Managed care annual statistical report. Sacramento, CA: California Department of Health Services, Medical Care Statistics Section, 1998.

Searching for Causes & Cures

March 2000