

Geographic Variations in Breast Cancer Mortality: Do Higher Rates Imply Elevated Incidence or Poorer Survival?

ABSTRACT

Objectives. Mortality rates from breast cancer are approximately 25% higher for women in the northeastern United States than for women in the South or West. This study examined the hypothesis that the elevation is due to decreased survival rather than increased incidence.

Methods. Data on breast cancer incidence, treatment, and mortality were reviewed.

Results. The elevated mortality in the Northeast is apparent only in older women. For women aged 65 years and older, breast cancer mortality is 26% higher in New England than in the South, while incidence is only 3% higher. Breast cancer mortality for older women by state correlates poorly with incidence ($r = 0.28$).

Conclusions. Those seeking to explain the excess breast cancer mortality in the Northeast should assess survival and should examine differences in cancer control practices that affect survival. (*Am J Public Health*. 1998;88:458-460)

James S. Goodwin, MD, Jean L. Freeman, PhD, Daniel Freeman, PhD, and Ann B. Nattinger, MD, MPH

Introduction

Breast cancer mortality rates in the northeastern United States are substantially higher than those in the rest of the country¹⁻³ and remain elevated after adjustment for potential risk factors.^{1,3} All previous explanations for this phenomenon have assumed that the elevated breast cancer mortality reflects an elevated incidence of breast cancer.³⁻⁷ We hypothesize that the bulk of the elevated mortality comes from decreased survival. Furthermore, we speculate that a contributor to the decreased survival could be the less-than-definitive treatment received by older women with breast cancer in the Northeast.

Summary of the Argument

The hypothesis that decreased survival rather than increased incidence is largely responsible for the elevated breast cancer mortality rates in the Northeast rests on the following points:

1. The elevated breast cancer mortality in the Northeast is entirely concentrated in older women.
2. Analyses of breast cancer incidence in older women based on Medicare claims data do not demonstrate an elevated incidence in the Northeast.
3. There is substantial geographic variation in breast cancer care, particularly for older women, which might contribute to geographic differences in survival.

Elevated Breast Cancer Mortality Is Found Only in Older Women

Table 1 presents breast cancer mortality rates for White females in 1990, by age category and census division. The increased breast cancer mortality in the Northeast is evident only in women aged 55 and older.

No Evidence of Elevated Breast Cancer Incidence Among Older Women in the Northeast

There has been considerable interest recently in the use of Medicare billing data to obtain population-based cancer incidence figures for men and women 65 years of age and older.¹⁰⁻¹³ Table 2 compares the mortality and incidence data for breast cancer in 1990 for states in New England, and in the South. The weighted mean mortality is 26% higher in the New England states than in the South, while the weighted mean incidence rate is only 3% higher.

We also performed correlations between incidence and mortality rates for the 50 states plus the District of Columbia for both breast cancer and colon cancer. Age-specific mortality rates for 1990 for women aged 65 and older were generated from the Center for Disease Control and Prevention's on-line Data for Epidemiologic Research system and were age-adjusted, using the Medicare population as the standard. The Pearson correlation between those mortality rates and the incidence rates generated from 1990 Medicare data was 0.28 for breast cancer, while it was 0.72 for colon cancer. Thus, variation in incidence rates accounts for approximately 50% of the variance in state mortality rates for colon cancer but less than 10% for breast cancer. The relatively high correlation between incidence and mortality rates for colon cancer offers indirect evidence for the accuracy of the incidence and mortality data, while the low correlation between

James S. Goodwin and Jean L. Freeman are with the Department of Medicine and the Sealy Center on Aging. Daniel Freeman is with the Sealy Center on Aging and the Office of Biostatistics, University of Texas Medical Branch, Galveston. Ann B. Nattinger is with the Department of Medicine, Medical College of Wisconsin, Milwaukee.

Requests for reprints should be sent to James S. Goodwin, MD, Sealy Center on Aging, Jennie Sealy Hospital 3-East, 301 University Blvd, Galveston, TX 77555-0460.

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TABLE 1—Breast Cancer Mortality Rates for White Women, by Census Division and Age: United States, 1990

Region Division	Age, y				
	25 to 44	45 to 54	55 to 64	65 to 74	75+
Northeast					
New England	8.62 (0.87)	45.18 (1.03)	84.57 (1.13)	121.84 (1.16)	183.63 (1.23)
Mid-Atlantic	9.94 (1.00)	48.10 (1.09)	93.82 (1.25)	134.69 (1.28)	179.39 (1.21)
Midwest					
East North Central	9.74 (0.98)	46.96 (1.07)	81.68 (1.09)	117.74 (1.12)	172.93 (1.16)
West North Central	9.74 (0.98)	42.30 (0.96)	72.26 (0.97)	114.37 (1.09)	158.46 (1.06)
South					
South Atlantic	9.94 (1.00)	43.97 (1.00)	74.86 (1.00)	104.83 (1.00)	148.83 (1.00)
East South Central	10.13 (1.02)	44.19 (1.00)	72.95 (0.97)	91.5 (0.87)	129.68 (0.87)
West South Central	10.79 (1.09)	43.03 (0.98)	74.28 (0.99)	100.83 (0.96)	137.75 (0.93)
West					
Mountain	8.65 (0.87)	40.67 (0.92)	76.27 (1.02)	109.36 (1.04)	158.45 (1.06)
Pacific	10.27 (1.03)	47.38 (1.08)	78.56 (1.05)	115.32 (1.10)	160.97 (1.08)

Note. The age-specific rates are expressed as number of deaths per 100 000 women in each age category. Number of deaths in each category was obtained by adding the number of deaths in the age category across every state in the region, using data from the 1990 *Vital Statistics of the United States*.³⁷ The corresponding population counts were obtained from the US Bureau of the Census.³⁸ The ratio of the rate of each division compared with the South Atlantic rate is given in parentheses. The rates for all the southern divisions cluster around the South Atlantic rate for each age category. The rates for Mid-Atlantic and New England divisions are similar to those of the southern divisions for women aged 25 through 44 and 45 through 54. However, in the older age groups there is an increasing disparity between the Northeast and the South.

incidence and mortality rates for breast cancer suggests that factors affecting survival are key to understanding geographic differences in breast cancer mortality.

Why Might Survival with Breast Cancer Be Lower in the Northeast?

If variation in incidence is responsible for only a small part of the variation in breast cancer mortality, then there must exist substantial geographic variation in survival. Survival from cancer is the product of a complex interaction of host factors (age, comorbidity, etc.), tumor factors (hormone receptor status, histologic type, etc.) and medical care factors (size and stage at diagnosis, type of treatment, adherence to treatment, etc.). There have been 2 previous studies from Europe reporting geographic variation in survival with breast cancer, one attributing the difference to differences in tumor histology¹² and one to variations in treatment.¹³ There are no a priori reasons to postulate marked geographical variation in tumor biology or in the underlying health status of older women (e.g., life expectancy for 65-year-old women, a rough measure of health status, does not show major regional variation). On the other hand, there is considerable support for the concept that regional variation in medical care factors¹⁴ might contribute to the regional differences in survival.

TABLE 2—Age-Adjusted Incidence and Mortality Rates for Breast Cancer per 100 000 Women Aged 65 Years and Older: United States, 1990

	Incidence	Mortality
New England		
Maine	386.7	135.8
New Hampshire	364.8	173.4
Vermont	374.9	150.4
Massachusetts	376.9	152.7
Rhode Island	407.0	134.3
Connecticut	364.6	132.0
Weighted mean (New England)	376.4	145.8
South		
Alabama	397.8	108.0
Florida	370.9	122.1
Georgia	351.5	113.6
Louisiana	370.8	131.5
Mississippi	361.3	94.0
North Carolina	354.3	112.6
South Carolina	314.3	119.1
Texas	372.0	112.0
Weighted mean (South)	365.8	116.0

Note. The incidence rates shown were calculated by McBean et al.⁸ using 1990 Medicare Part A claims data (and using 1985–1989 Medicare data to identify and delete prevalent cases). Mortality rates were calculated by the authors, using 1990 US vital statistics³⁷ and US Census Bureau³⁸ data. Both mortality and incidence rates were age-adjusted according to the 1990 Medicare population.³⁹

Many studies have shown that older women with breast cancer are less likely to receive complete evaluations and appropriate treatment than are younger women.^{15–29} For example, older women are much more likely to receive lumpectomy without axillary dissection, resulting in inaccurate staging, and they are more likely to receive

breast-conserving surgery without subsequent radiation, a treatment not recommended by any authority.¹⁷ Breast-conserving surgery without radiotherapy has been associated with higher rates of local recurrence in prospective trials³⁰ and higher mortality in population-based studies.^{31,32} Most relevant to the present discussion is that

inappropriate treatment varies by geographic area.^{27-29,33}

We analyzed data for 1987 through 1990 from the Surveillance, Epidemiology, and End Results program; the percentage of women aged 75 or older with local or regional breast cancer who received breast-conserving surgery without radiotherapy varied from less than 12% in Iowa, New Mexico, and Utah to more than 21% in Connecticut and Detroit, Mich. For women aged 65 through 74, it varied from 2.3% in Iowa to more than 10% in Connecticut and Detroit.

Other treatment factors that would influence survival include use of chemotherapy and estrogen antagonist. There is no good information on geographic variation in the use of these agents. Breast cancer screening tests, which should influence survival by decreasing size and stage at diagnosis, also vary by geographic area,^{3,34} but there are no clear differences in screening of older women between the Northeast and the South.³

A goal of the Healthy People 2000 initiative is to reduce the death rate for female breast cancer.³⁵ Breast cancer mortality has fallen substantially in the last decade, but not in women older than 70 years.³⁶ Some areas of the country currently have substantially lower breast cancer mortality than other areas. If we assume that these differences in mortality are due to differences in incidence, then lowering mortality in the high-mortality areas becomes a very distant goal because there are no well-accepted methods to reduce incidence.

On the other hand, the recognition that mortality differences are secondary to differences in survival makes the goal of lowering mortality much more realistic. This should stimulate studies into regional differences in cancer care that contribute to these differences in survival. □

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