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Using NCI's Atlas of Cancer Mortality in the United States 1950-94 and Cancer Mortality Maps and Graphs Web Site Some Cautions and the Example of Black Versus White Women's Mortality Rates

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Maps have long been of interest to all those seeking to understand the larger trends of cancer and to generate possible explanations for the differences in rates seen. In the last two years, there has been an enormous increase in the availability of cancer maps. The National Cancer Institute (NCI) published the *Atlas of Cancer Mortality in the United States, 1950-94* in December 1999. Its complementary web site, *Cancer Mortality Maps & Graphs* (www.nci.nih.gov/atlasplus/) went up simultaneously, and subsequent enhancements have added interactive features to the information contained in the *Atlas*.

A wealth of information. The wealth of almost instant information, and the visual clarity provided by these maps cannot be overstated. For example, with one look, a reader of the *Atlas* or visitor to the web site will be impressed by the north-south gradient in breast cancer mortality. With some simple "customizing" of maps made possible by the web site, one can easily go on to see how this trend plays itself out over time - differences lessen over the time period covered, as mortality rates rose in many parts of the south. One can also see the differences among blacks as compared to whites*, and between several age groups. (Mortality rate differences between black and white women, in two age groups, will be further explored here as an example of a problem clearly illustrated by the maps, and generating research interest.) Dr. Susan Devesa, lead author of the *Atlas* and Chief of the Descriptive Studies Section in the Epidemiology and Biostatistics Program at NCI, points out that "the pronounced north-south gradient has been evident among white women for decades. Data specifically for black women are presented for the first time in the *Atlas*, and there is some suggestion of a north-south gradient among black women, particularly pronounced among post-menopausal women."

The web site provides the ability to create bar charts and trend line graphs, as well as to access the tabulated data used to create the maps. It therefore offers both an alternate way to view the same data, plus additional information and extensive interactive possibilities.

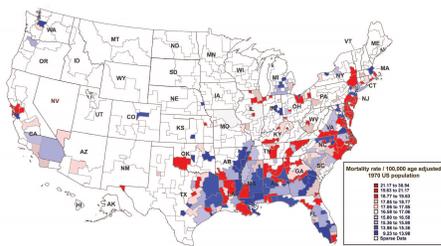
Cautions in interpretation. It is important to keep in mind some principles of mapping and aspects of these data when viewing these maps. One is that NCI's purpose here is hypothesis generating, not explanatory. For cancers with rates that vary widely across geographic areas, mapping can be very helpful in formulating theories to test. And although we might intuit some "answers" of possible risk factors in areas with high rates, epidemiological studies need to follow through carefully. "Stimulating research which uncovers the reasons for the patterns we see is our goal," says NCI's Dr. Devesa. An example of a study initiated in response to these data include that of Sturgeon and colleagues which attributed regional variations in breast cancer mortality mainly, but not totally, to the distribution of established risk factors (Sturgeon, et al., 1995).

It is also key to remember the difference between mortality data and incidence data (the *Atlas* and web site present

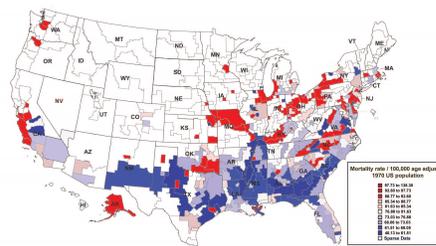
only mortality data). A mortality rate is based on deaths from a specific cause or disease in a population. An incidence rate, on the other hand, is based on the number of new cases of a particular disease diagnosed in a specific population. Incidence data on breast cancer are not available nationwide to the same extent that mortality data are (although they are available on a county and even zip code basis in New York State). The incidence data that do exist on a national scale are based on a selected nine regions of the country, covering about ten percent of the population, through the NCI's Surveillance, Epidemiology and End Results (SEER) program (<http://seer.cancer.gov/>). More recent estimates are based on an expanded system of eleven regions, covering about fourteen percent of the population. Data from other existing non-SEER state systems of collecting incidence data are not necessarily comparable with SEER data. The relationship between a specific cancer's mortality rates and incidence rates depends upon, most importantly, the survival of patients diagnosed with that cancer. For cancers with poor survival rates, incidence and mortality rates closely reflect each other. Early detection/screening and differences in medical care and healthcare delivery systems can also have profound influences on these rates and their relationship to each other.

Selected maps for black versus white breast cancer mortality. From among the numerous possibilities available to display breast cancer information, we have chosen to picture here four maps showing two age groups, for both black and white women. Data are not available specifically for other ethnic groups. Maps are available illustrating both counties and state economic areas (SEAs); we picture here the SEA maps. SEAs are individual counties or groups of counties that are relatively homogenous with respect to various demographic, economic, and cultural factors, and do not cross state lines.

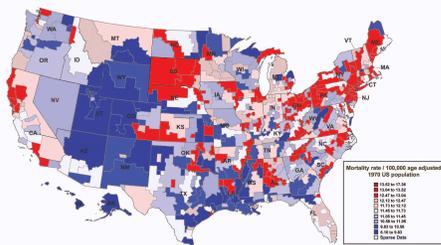
Mortality Black - 20 to 49



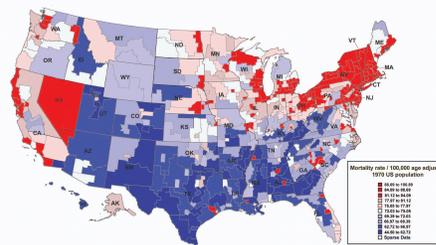
Mortality Black - 50 to 74



Mortality White - 20 to 49



Mortality White - 50 to 74



NOTE: for a larger view of these maps you can click on the image. Or access them through our [maps and statistics section](#).

We have chosen these maps to illustrate just one set of data that presents an important problem to explore: how great is the difference, and what might account for the difference, in breast cancer mortality between black women and white women? The data reveal an interesting aspect to this problem: there is a much greater difference in the mortality rate between black and white women in the age 20-49 category than there is for the age 50-74 category. The mortality rate for black women in the age 20-49 category is 17.39 per hundred thousand, whereas for white women it is 12.26. Some hypotheses that have been proposed to explain the black/white differences include:

- Differences in genetic susceptibility, gene-environment interactions and/or types of tumors
- Differences in stage at detection
- Differences in insurance coverage, availability of care and/or course of treatment
- Differences in age at menarche (a risk factor) and age at first birth (younger being more protective).

Some existing explorations of these differences. Several reports have been published exploring these questions. A review article conducted under the auspices of the National Action Plan on Breast Cancer addresses "the excess burden

of breast carcinoma in minority and medically underserved communities," reviewing surveillance and other reports and recent literature on disparities in cancer incidence and mortality (Shinagawa, 2000). Several aspects of the emerging data on breast cancer in African American (AA) women are cited, such as the suggestion that breast cancer is more aggressive in AA women, and that AA women experience a higher percentage of premenopausal breast carcinoma, a more virulent form of the disease. The author calls for enhanced surveillance and targeted research efforts in minority communities in which these disparities are found.

A population-based study in Florida (Roetzheim, 2000) examined the hypotheses that:

- insurance payer would influence treatments received and would affect their survival primarily through later stage at diagnosis, and;
- race would not be associated with care or outcomes once health insurance payer was controlled.

The study analyzed information about non-Hispanic whites, non-Hispanic African Americans, Hispanics and others. The study team did find that "breast cancer carcinoma patients in Florida who were uninsured or insured by Medicaid had higher mortality rates than those who had commercial fee-for-service insurance, most likely as a result of later stage at diagnosis (and that) (n)on-Hispanic African-American women with breast carcinoma in Florida also had higher mortality rates even when stage at diagnosis, treatment modality, health insurance payer, and socioeconomic status were considered" (Roetzheim, et al., 2000, p. 2211).

A recent study noted that from 1990-1995 white women experienced a 1.9% decrease in breast cancer mortality, while black women saw no change (Marbella and Layde, 2001). In one of this study's analyses, trends in differences between black and white women's breast cancer mortality was extremely pronounced in the youngest groups: in 1993-1996 they found that black women 35 years old and younger had a mortality rate more than twice that of white women in the same age group. This study also observed a change in mortality trends among older (70 and over) black women in which the mortality rate caught up with, and then surpassed that of white women. The authors review evidence on a variety of possible explanations and put forward the possibility that all of the factors mentioned above may together partially explain the higher rates among black women. But they go on to say that the large increase in mortality they found in older black women from 1993-1996 cannot be explained by these factors. For example, they discuss that the adverse effect of early menarche** may be more evident in younger women and the beneficial effect of early age at first birth may be more evident in older women, which would be consistent with the data in the early years of their study. But for the 1993-1996 mortality increases in older black women, early pregnancy did not seem to produce a protective effect.

Clearly there are important behavioral, public health and clinical implications to any evidence produced explaining why black women die - especially younger black women - from breast cancer at higher rates than white women do. We have used this example as just one of the many hypothesis-generating examples of the NCI breast cancer mortality data. It is our hope that researchers will continue to respond to the many knowledge gaps made visible by these data, and that some of the many breast cancer "puzzles" will be solved. We encourage you to order a copy of the atlas by calling 1-800-4-CANCER (1-800-422-6237) and/or to view and create maps, charts, graphs and tabulated data on the web. We also invite you to view the customized maps that BCERF has chosen to create with the NCI data and displayed on our web site at www.cfe.cornell.edu/bcerf/

Thank you to BCERF webmaster Marie Stewart for her work preparing the maps for this article.

** The terms "black" and "white" will be used in this article, unless a specific study mentioned uses different terms, in which case that study's terminology is used.*

*** Evidence indicates that African American girls begin menstruation earlier than white girls; see for example Herman-Giddens, et al., 1997.*

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