Geographic Information System for Breast Cancer Studies on Long Island (LI GIS): Researchers Encouraged to Apply

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Abstract

The Geographic Information System for Breast Cancer Studies on Long Island (LI GIS) is an enterprise geographic information system combining data, ESRI ArcGIS, and statistical and spatial software and extensions. The research tool is designed to study the potential relationships between environmental exposures and breast cancer in Nassau and Suffolk counties (Long Island). It also is available to researchers for studying other diseases. The LI GIS warehouse contains more than 80 datasets covering geographic, demographic, health outcome, and environmental data. Researchers can apply to use the entire LI GIS and/or the LI GIS statistical software and spatial extensions. In addition, four custom extensions developed for the LI GIS are available to freely download from its Web site. Researchers with approved protocols can access the LI GIS remotely or work in its laboratory in Reston, Va. There usually is no fee to use the LI GIS, but funding for research is not provided. The LI GIS is funded by the National Cancer Institute (NCI), which is part of the National Institutes of Health (NIH), U.S. Department of Health and Human Services (HHS). It was developed and is maintained under a contract with Titan Corporation. Learn more about the LI GIS and apply to use it at www.healthgis-li.com.
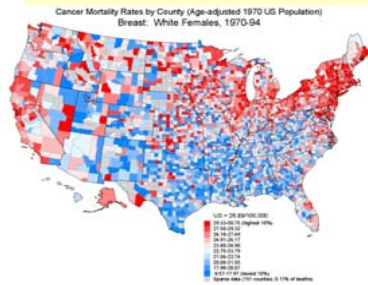
Introduction

Maps of the geographic distribution of breast cancer mortality for the United States have shown a pattern of elevated rates among white females in the Mid-Atlantic, Northeast, and North Central regions, and some areas of the West. This pattern has persisted for more than four decades and is also seen in Long Island. Geographic variations in the distribution of breast cancer mortality rates for black women were not as pronounced.
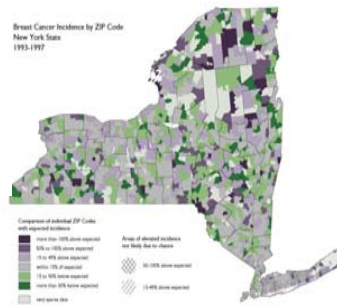
Map 1 below shows the geographic distribution of mortality rates for breast cancer for white females in the United States for 1970-1994 (Devesa SS, NCI, 1999). The dark red areas have the highest mortality rates and the dark blue colors have the lowest mortality rates. See also NCI Cancer Mortality Maps & Graphs: www3.cancer.gov/atlasplus.

Map 2 is from the New York State Department of Health Cancer Surveillance Improvement Initiative (CSII). It shows whether the breast cancer incidence for each ZIP Code in New York State is higher (purple color), lower (green color), or about the same as expected (gray color) for 1992-1997. The map also shows areas where the breast cancer incidence is higher than expected compared to the state of New York as a whole, and the elevation is likely not to be due to chance (represented by dashed patterns). See also: www.health.state.ny.us/healthaz.

Map 1.

Cancer Mortality Rates by County (Age-adjusted 1970 US Population) Breast: White Females, 1970-94

Map 2.

Breast Cancer Incidence by ZIP Code New York State 1993-1997

In the early 1990s, the U.S. Congress mandated an investigation into the high rates of breast cancer in Nassau and Suffolk counties (Long Island), New York, and the development of a geographic information system for use in exploring possible environmental causes of breast cancer. The Geographic Information System for Breast Cancer Studies on Long Island (LI GIS) is one of a series of activities undertaken as part of the Long Island Breast Cancer Study Project (LIBCSP). The LI GIS is funded by the National Cancer Institute (NCI) and managed by the Epidemiology and Genetics Research Program and Surveillance Research Program, Division of Cancer Control and Population Sciences. Titan Corporation developed and maintains the LI GIS under a contract.

The LI GIS offers scientists a unique tool with which to explore relationships between environmental exposures and risk for breast cancer. It also enables researchers to estimate exposure to environmental contamination. Access to the LI GIS is limited to researchers with approved protocols and is at no expense to the user, although special requests may entail costs to the researcher. Funding to support research is not provided.
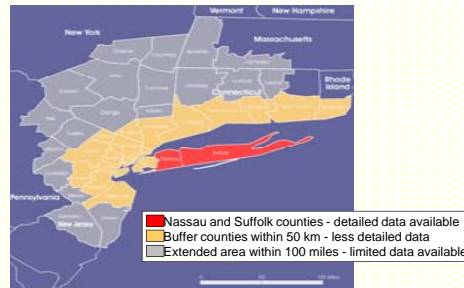
Researchers may apply to use the entire LI GIS and/or its statistical and spatial extensions. Also, four custom extensions are freely available and may be downloaded from the Web site.

Possible Research Uses

The LI GIS enables researchers to:

- Explore and synthesize available information on potential exposures
- Generate hypotheses
- Identify spatial and temporal clusters of disease
- Evaluate risk factors for breast cancer and other health outcomes (with your addition of data)
- Address methodological issues
- Identify gaps in available information.

Geographic Extent of LI GIS

- Nassau and Suffolk counties - detailed data available
- Buffer counties within 50 km - less detailed data
- Extended area within 100 miles - limited data available

Data Warehouse

The *LI GIS warehouse* contains more than 80 datasets covering:

- Geographic attributes, including location of roads, water feature, parks and landmarks
- Demographic data, such as age, race, sex, and income of the population
- Health outcome data, including relative breast cancer incidence
- Environmental data for Nassau and Suffolk counties including land use; land cover; railroads; traffic; water use; potential sources of water pollution; releases of chemicals into water, air, and soil; information on toxic chemicals and hazardous and municipal waste; radiation; and to a lesser extent, environmental data for surrounding counties.

Sources of the data include:

- State Health Departments
- U.S. Geological Survey
- U.S. Postal Service
- U.S. Bureau of the Census
- U.S. Environmental Protection Agency
- U.S. Department of Agriculture

View the Metadata Browser on the LI GIS Public Web Site
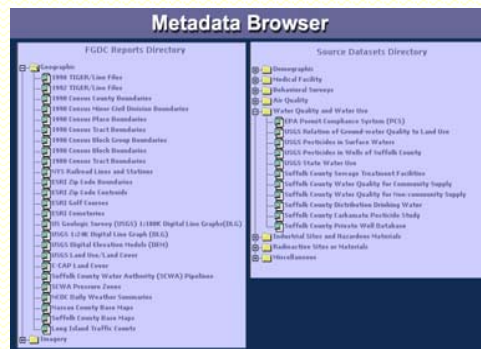
Researcher's Toolbox – *Sophisticated, Time-Saving Tools!*

The LI GIS has a full suite of GIS software and extensions related to the study of breast cancer:

- ESRI ArcGIS software suite
  - ArcView and ArcInfo
  - Spatial Analyst and 3D Analyst
- Extensions for epidemiological studies
  - Case File Formatter
  - Cluster Analysis Tool (using SaTScan)* (see Figure 1)
  - Disease Rate Calculator* (see Figure 2)
  - Areal Interpolator*
  - Empirical Bayes Tool*
  - Geographic masking

- EpiAnalyst
- S-Plus with Spatial Stats
- SAS
- Oracle 9i
- Additional ArcView extensions and software
- Online User's Guide

* These four custom extensions are publicly available and may be freely downloaded from the LI GIS Web site.

Download, Free Custom Extensions from LI GIS Web Site

Four custom extensions have been developed for the LI GIS and are freely available from its public Web site.
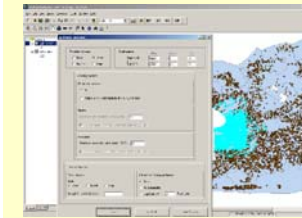

Figure 1. The Cluster Analysis Tool is an interface to the cluster analysis software application SaTScan developed by Martin Kulldorff, Ph.D., while at NCI. SaTScan Web site: www.satscan.org
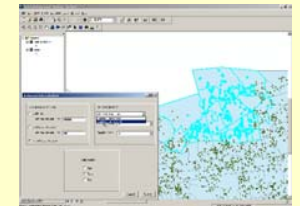

Figure 2. The Disease Rate Calculator calculates adjusted disease rates.

In addition to the extensions illustrated above, two other custom extensions are available:

- Empirical Bayes (EB) Tool applies the Empirical Bayes method, which is a statistical method useful for small areas and/or rare diseases. An EB rate is a weighted average of local rates and an overall rate, weighted by relative population sizes of the areas.
- Areal Interpolator, which uses simple areal interpolation to calculate the number of cases, controls, and the population for a given area, assuming they are distributed uniformly over the area.

Learn About the LI GIS and Apply!

Researchers may access the LI GIS remotely or work in its laboratory located in Reston, Virginia. Learn about the LI GIS and apply:
www.healthgis-li.com.

LI GIS Lab: 703-434-4386
E-mail: administrator@healthgis-li.com