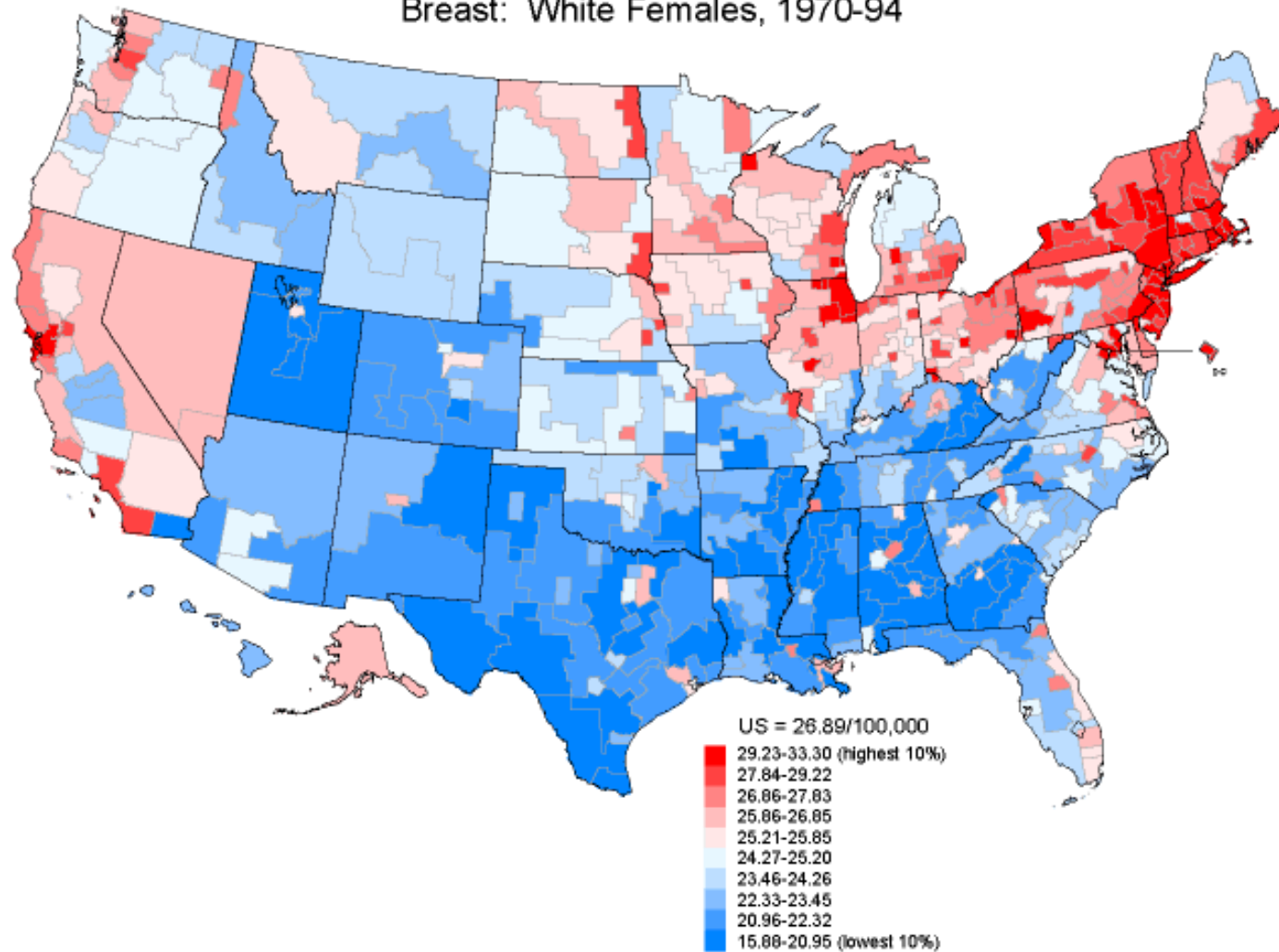




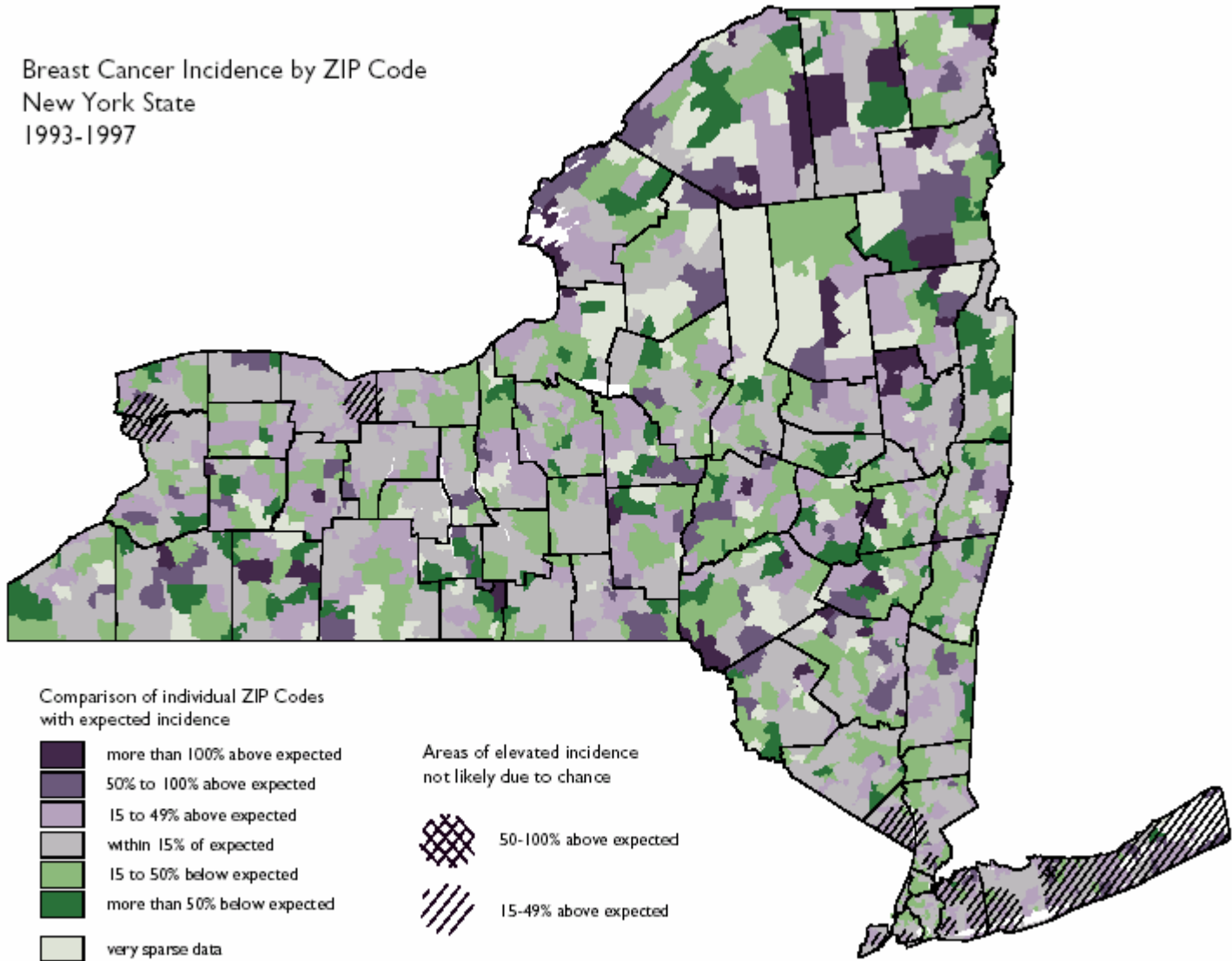
# Long Island Geographic Information System

Deborah M. Winn  
Epidemiology and Genetics Research Program  
Division of Cancer Control and Population Sciences  
National Cancer Institute

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



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



# Long Island Breast Cancer Study Project

- Grew out of community's concern
- A multistudy investigation of environmental factors and breast cancer
- NCI developed the LI GIS in response to a law passed in 1993



# Public Law 103-43

June 10, 1993

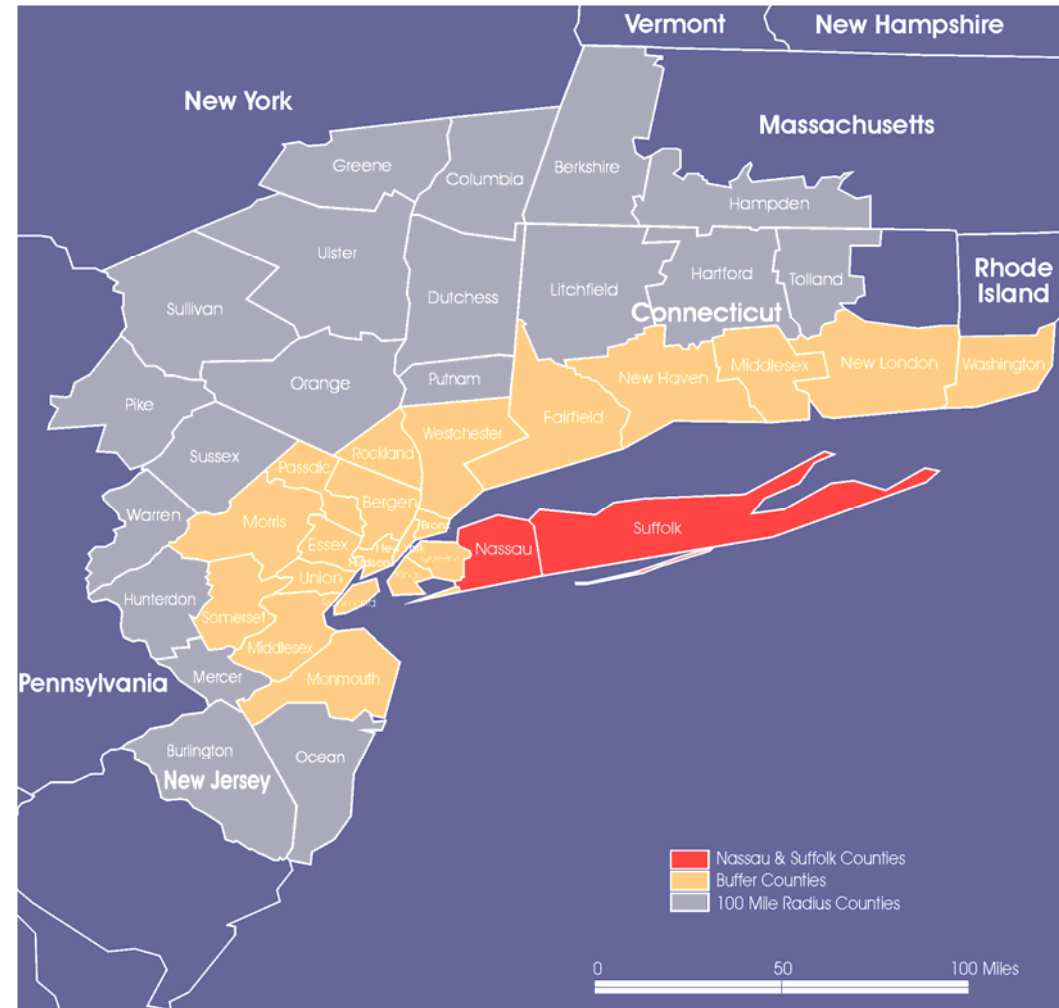
- “The director of the NCI. . .shall conduct a case-control study [of] factors contributing to the incidence of breast cancer in:
  - The counties of Nassau and Suffolk, and
  - The 2 counties in the northeastern U.S. [that] had the highest age-adjusted mortality rate of such cancer. . .”

# Public Law 103-43, GIS Requirement

- Certain elements of the study ... shall include the use of a geographic system to evaluate the current and past exposure of individuals, including direct monitoring and cumulative estimates of exposure, to:
  1. contaminated drinking water
  2. sources of indoor and ambient air pollution, including emissions from aircraft
  3. electromagnetic fields
  4. pesticides, and other toxic chemicals
  5. hazardous and municipal waste
  6. other factors as appropriate.

# Geographic Extent

- Nassau and Suffolk counties (red) - detailed health, demographic, environmental data.
- Buffer counties within 50 km - additional environmental data (less precision, detail)
- Extended area within 100 miles of mid-point of counties' boundary line (limited data)



# Created GIS for:

- Two Audiences:
  - Researchers
  - The Public
- Both groups have similar questions, but different uses for GIS.



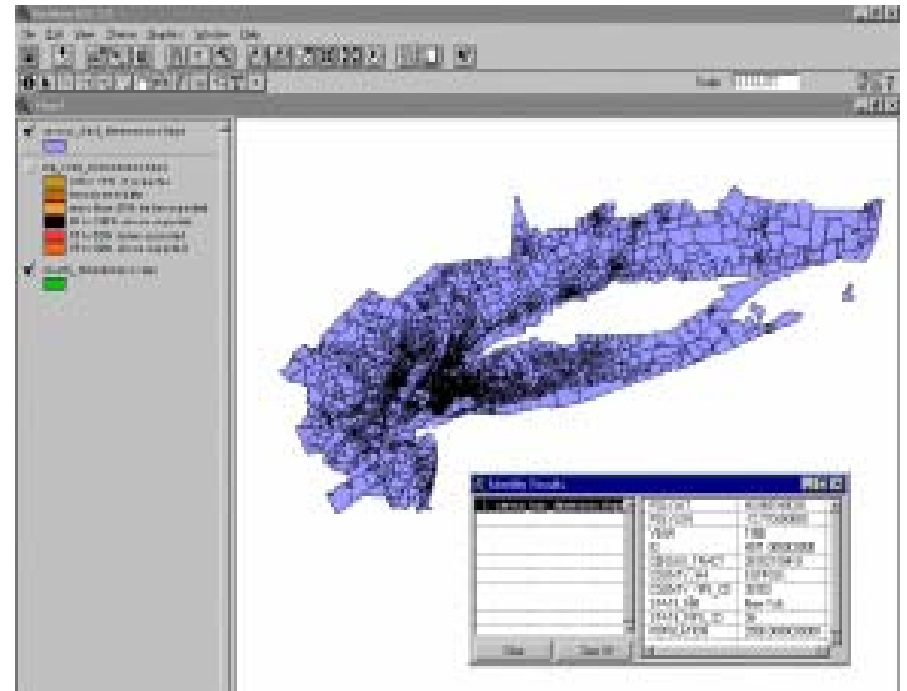
# GIS Capabilities

- 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



# Data Included in the LI GIS

- Geospatial
- Demographic and Behavioral
- Health
- Environmental



# Geospatial



- Base Maps:
  - Cadastral\* data (tax lots, parcels)
  - Political boundaries
  - Roads
  - Railroads
  - Hydrology (water supply, rivers, streams)
  - Aerial photography and satellite imagery

# Demographic and Lifestyle

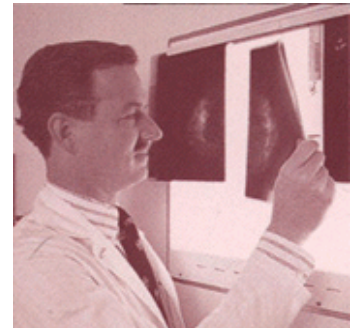
- Census Data:
  - Counts of the population
  - Descriptive information about individuals
    - Age, Race, Gender, Income groupings
  - Households
    - Type and age of housing
    - Rural or urban

# Health

- **Breast Cancer Information**

- Maps providing information about breast cancer by ZIP
- Breast cancer data are provided by the NY State Cancer Registry.
- The maps depict relative breast cancer rates.
- The map colors depict whether the ZIP code has rates that are the same as the State or higher or lower and by how much.
- The location of individual women with breast cancer are not shown to protect their privacy and confidentiality.

- **Medical Facilities**



# Health

- **Relative breast cancer rates defined:**

- *Maps providing information about breast cancer by ZIP Code in Long Island and surrounding counties are located below. Breast cancer data are provided from the NY State Cancer Registry. The breast cancer data is shown as a statistic that compares the data for the ZIP code with that for the State of New York as a whole. This is measured by estimating the number of women newly diagnosed with breast cancer over the course of a year who lived in the ZIP code divided by the total number of women living in the ZIP code, giving the rate of breast cancer in the ZIP code. This number is divided by the rate for New York as a whole – the number of women newly diagnosed with breast cancer over the course of a year who lived in New York State divided by the total number of women living in New York state that year. The location of individual women with breast cancer are not shown to protect their privacy and confidentiality.*

# Environmental

- Air quality monitoring results
- Drinking water analysis and water use
- Industrial sites, industrial releases and hazardous materials
- Radioactive sites or materials
- Land use and land cover
- Traffic volume
- Weather and climate information
- Other: weather, satellite image maps



# Data Sources

- County: Water Authorities and Departments of Health
- State: Departments of Environmental Conservation, Health, Labor, and Public Service
- Federal: Centers for Disease Control, National Center for Health Statistics, Environmental Protection Agency, Nuclear Regulatory Commission, Geological Survey, Census, Department of Agriculture



# Metadata

- Need to understand data limitations
- For each dataset, information on...
  - Identification
  - Data quality
  - Spatial data organization
  - Spatial reference information
  - Entity and attribute overview
  - Distribution

# Software Included in GIS: Researcher's Toolbox

- ArcInfo
- ArcView Spatial Analyst
- ArcView 3D Analyst
- S-Plus
- S-Plus for ArcView
- S-Plus Spatial Stats
- EpiAnalyst
- SAS
- Adobe Photoshop \*
- Microsoft Visual C/C++ \*
- Microsoft Visual Basic \*
- JDeveloper (Java development Environment) \*
- Microsoft Office Professional \*
- \* available only in the LI GIS Lab

# PLUS: Custom software available for downloading

- 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
- Empirical Bayes 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.

# Custom software available for downloading (2)

- Cluster analysis tool checks for clusters of sample cases using Sat Scan software as the cluster analysis engine
- Disease rate calculator calculates directly adjusted rates for selected census tracts

# Data and Software

- Available on Website: <http://www.healthgis-li.com>

The screenshot shows a Microsoft Internet Explorer browser window displaying the website for the Long Island Geographical Information System (LI GIS). The browser's address bar shows the URL <http://www.healthgis-li.com/>. The website's navigation menu includes "LI GIS Maps", "Researchers", "Metadata Browser", and "Help Desk". The main content area features a map of Long Island with the text "Long Island Geographical Information System (LI GIS) Part of the Long Island Breast Cancer Study Project (LIBCSP) A tool for research on breast cancer on Long Island". A sidebar on the left contains a menu with items: "Overview", "FAQ", "Reports & Activities", "Advisory Groups", "Links", "NCI", "LIBCSP", and "LI GIS Project". The main content is divided into two sections: "LI GIS and the Public" and "LI GIS and Researchers". The "LI GIS and the Public" section includes links to find out what is in the LI GIS Data Warehouse and to view interactive maps. The "LI GIS and Researchers" section includes a link to find out what the LI GIS offers researchers, with a list of features: a Data Warehouse with over 80 datasets, metadata about source data, geographic mapping software, and sophisticated statistical software. The browser's status bar at the bottom shows "Slide 23 of 30", "Default Design", "English (U.S.)", and "Internet". The Windows taskbar at the very bottom shows the Start button, several open applications (Microsoft PowerPoint, Microsoft Outlook, Geographic Information System), and the system tray with the time "9:50 AM".

Geographic Information System for Breast Cancer Studies on Long Island - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Address <http://www.healthgis-li.com/>

LI GIS Maps Researchers Metadata Browser Help Desk ?

**Long Island**  
**Geographical Information System (LI GIS)**  
Part of the Long Island Breast Cancer Study Project (LIBCSP)  
*A tool for research on breast cancer on Long Island*

**Overview**  
FAQ  
Reports & Activities  
Advisory Groups  
Links  
NCI  
LIBCSP  
LI GIS Project

**LI GIS and the Public**

- Go — Find out what is in the LI GIS Data Warehouse using the Metadata Browser
- Go — View the geographic extent of the LI GIS

Interactive Maps to look at environmental and demographic information about Long Island (under construction)

**LI GIS and Researchers**

- Go — What does the LI GIS offer researchers?
  - A Data Warehouse providing over 80 datasets
  - Metadata about source data and online guides to the contents of the Data Warehouse
  - Geographic mapping software and tools
  - Sophisticated statistical software and tools

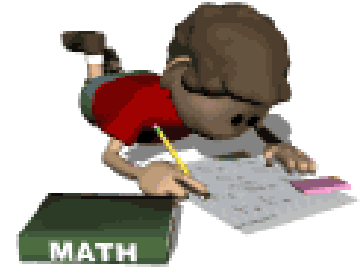
Access the LI GIS Flyer [Here...](#)

CANCER IN THE ENVIRONMENT

Slide 23 of 30 Default Design English (U.S.) Internet

start Microsoft Pow... Microsoft Out... Geographic In... AOL Search Go 9:50 AM

# Researchers may...



- Apply to use
  - The entire LI GIS
  - The LI GIS statistical software and spatial extensions
- Work
  - Remotely, or
  - At the LI GIS laboratory in Reston, VA

# Applying to use the LI GIS Data

- **Access** to researcher site is **limited** to investigators with approved protocols
- **Application process** and forms are on the **website**.
- Researcher must submit
  - Completed **LI GIS Data and Software Use Agreement Form**. This form describes user responsibilities associated with using the LI GIS data.
  - Brief written **research proposal** describing the project and how the LI GIS data will be used.
- *If your organization is a consulting firm, contractor, or pharmaceutical company, your proposal must include information about the funding source and a letter from the funder indicating that you are free to work and publish your findings without limitations by the funder.*

# Applying to LI-GIS

## LI GIS and Researchers

Go — What does the LI GIS offer researchers?

- A Data Warehouse providing over 80 datasets
- Metadata about source data and online guides to the contents of the Data Warehouse
- Geographic mapping software and tools
- Sophisticated statistical software and tools
- Remote access to the tools and Data Warehouse
- Local access to the LI GIS Laboratory
- Help Desk and Online Trouble Reporting

Go — Downloadable Statistical Extensions **NEW TOOLS**

Go — Find out more about the data available in the Data Warehouse

Go — Contact us about applying to use the LI GIS in your research



**Access the LI GIS Flyer  
Here...**



**Cancer and the  
Environment: What You  
Need To Know, What You  
Can Do** [Order a copy or  
view online...](#)



FIRSTGOV



# LI GIS For the Public

- Public mapping facility still “in the works.”
- Updating:
  - Website Information
  - Maps
- Public can use maps to visualize and hopefully better understand cancer rates and environmental exposures in Long Island.

# Challenges to Creating Public Maps

- Data are imperfect
  - Examples: addresses, sparse data, data collected for other purposes
  - Potential exposure not necessarily actual exposure
  - Time frame and latency of cancer
- The eye is not a good analytic tool
- Confidentiality

# Challenges to Creating Public Maps

- Health Illiteracy
- Lack of GIS background
- Public Perception
- Economic/Legal Implications

# Public Maps

**Hazardous Waste Sites on Long Island - Microsoft Internet Explorer**

**NATIONAL CANCER INSTITUTE**

File | Ba | Address: | **pan** | clear all ? | print map ? | **Hazardous Waste Sites on Long Island** | Find an address...

zoom in | zoom out | zoom last | pan | identify | measure ? | intro | search | buffer | legend | **layers** | help ?

Click a point on the map or hold the mouse to draw a rectangle to zoom in

**Layers** | [Layer Information](#)

Redraw Map

Display

- Active Hazardous Waste Sites
- Inactive Hazardous Waste Sites
- EPA Hazardous Waste Sites
- County Boundary
- Breast Cancer Incidence by Zip Code

**Find a Zip Code**

Enter zip code:

**Active Layer:** Active Hazardous Waste Sites

lose attention to the descriptions of the data when providing clear and accurate data about breast

**Legend - Microsoft Internet Explorer**

- ▲ EPA Hazardous Waste Sites
- Breast Cancer Incidence by Zip Code**
- More than 100% above expected
- 50 to 100% above expected
- 15 to 49% above expected
- Within 15% of expected
- 15 to 50% below expected
- More than 50% below expected

Done | Start | 7:54 AM

# Public Website Information

- Additions:
  - LI Breast Cancer Study History
  - Study Findings
  - How Researchers Use GIS to answer research questions
  - Map Link (Disclaimer, Tutorial, Maps)

Overview

FAQ

Reports & Activities

Advisory Groups

Links

NCI

LIBCSP

LI GIS Project

Long Island  
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LI GIS and the Public

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Interactive Maps to look at enviornmental and demographic information about Long Island (under construction)



# GIS Geographic Information Systems

Search:  
[Home](#) [Contact Us](#) [GISSIG](#)

A Web site supported by the NCI for use by the public, cancer researchers, and the GIS Special Interest Group.

## About GIS at NCI

- [About this Site](#)
- [About the GIS Special Interest Group](#)
- [Contact Information](#)

## Overview of GIS at NCI

- [Introduction to GIS at NCI](#)
- [Geographic-based Research & Applications at NCI](#)
- [GIS Database Development](#)
- [Spatial Data Analysis](#)
- [Geovisualization Tools Development](#)
- [Communication of Georeferenced Statistics](#)

## Examples of GIS Applications

- [Federal Government](#)
- [State Health Departments](#)
- [General Use of GIS in Public Health](#)

## Data Sources

- [Links to NCI & Other Government Data](#)
- [Miscellaneous Data](#)

## Key NCI Initiatives

- [State Cancer Profiles](#)
- [Cancer Mortality Maps & Graphs](#)
- [Long Island Breast Cancer Study Project](#)
- [US Predicted Cancer Incidence, 1999: Spatial Projection Models](#)

## Tools & Resources

- Please read our [Disclaimer](#)
- [General Resources](#)
- [Mapping](#)
- [Spatial Analysis](#)
- [Data Visualization](#)
- [Health Disparities](#)
- [Miscellaneous Tools](#)
- [Professional Services](#)
- [GIS Organizations](#)
- [Regulations \(HIPAA, Confidentiality, Accessibility\)](#)

## Funding

- [How to Obtain Funding](#)
- [Currently Funded GIS Grants](#)
- [National Science Foundation Grants Program](#)

## What's New

- [Spatial Statistical Analysis at the National Cancer Institute \(PDF\)](#)
- [Improving the Communication of Geographic Patterns of Disease through Computer-based Tools \(PDF\)](#)

## Helpful Links

- [GIS Dictionary](#)
- [Upcoming GIS Events](#)

## Publications

- [Best Practices](#)
- [Papers](#)
- [Journals](#)
- [Confidentiality Regulations in Research](#)
- [Newsletters, Listservs, URLs](#)
- [Search PubMed](#)

## Training

- [Online Courses](#)
- [Reference](#)



This Web site is maintained  
by the [Statistical Research](#).

[Contact Us](#)  
[Accessibility Feedback](#)



Start

Desktop

Disconnected - Blac...

Connected TLM

Inbox - Microsoft O...

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Download Manager

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Microsoft PowerPoint

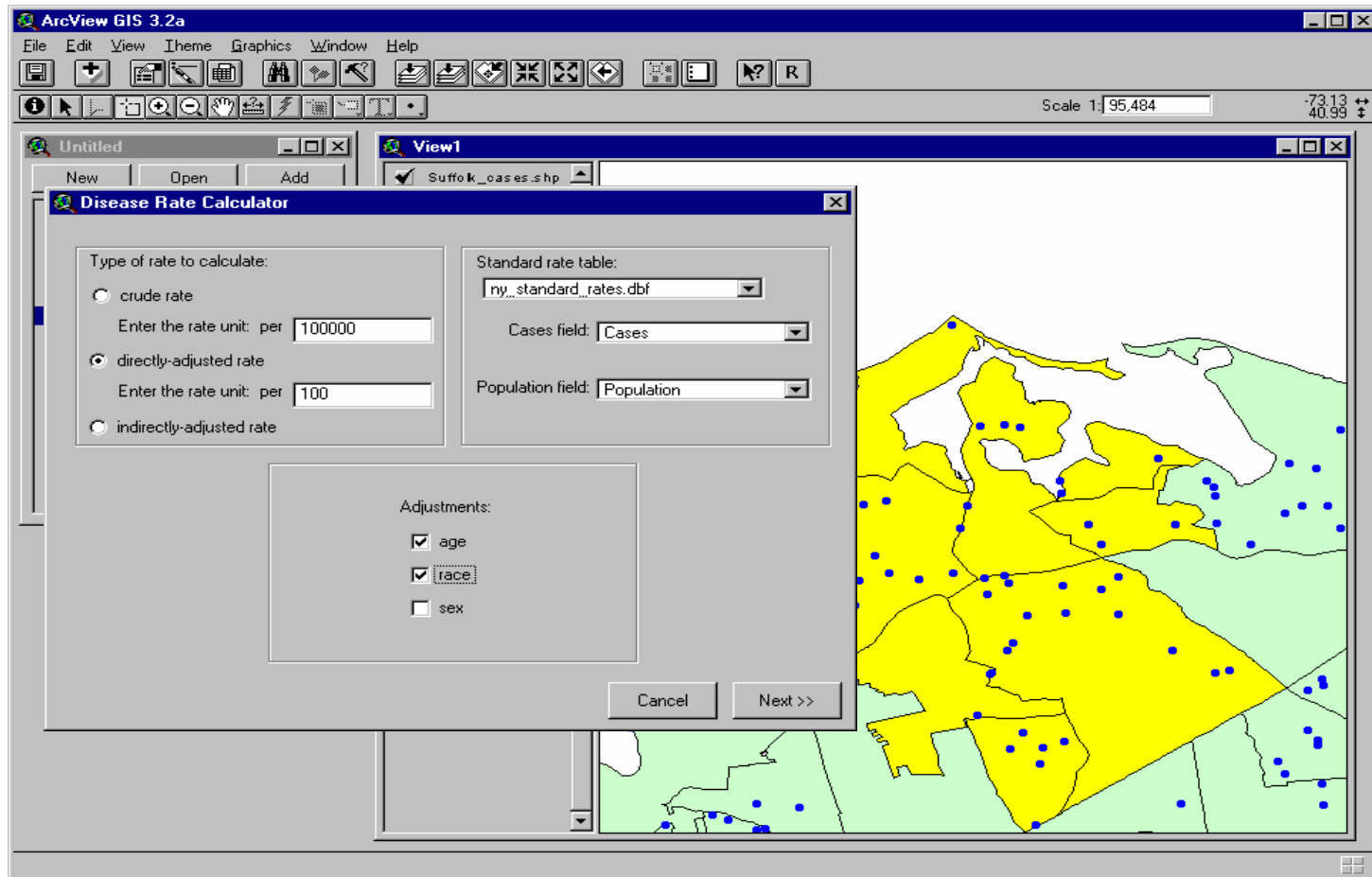


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# To reach us

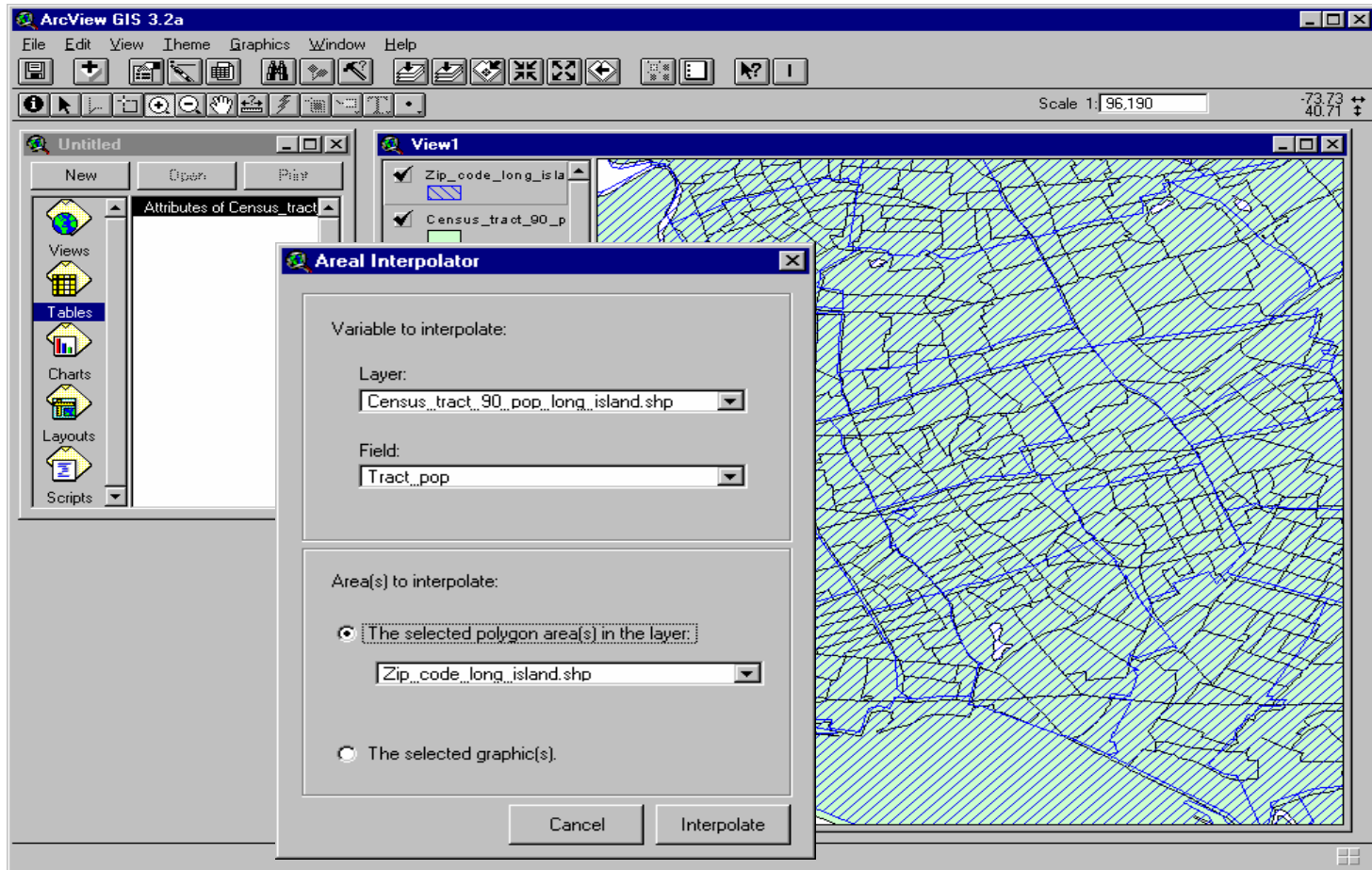
- Website: <http://www.healthgis-li.com>
- Phone: 703-434-4386
- Email: administrator@healthgis-li.com

# Disease Rate Calculator

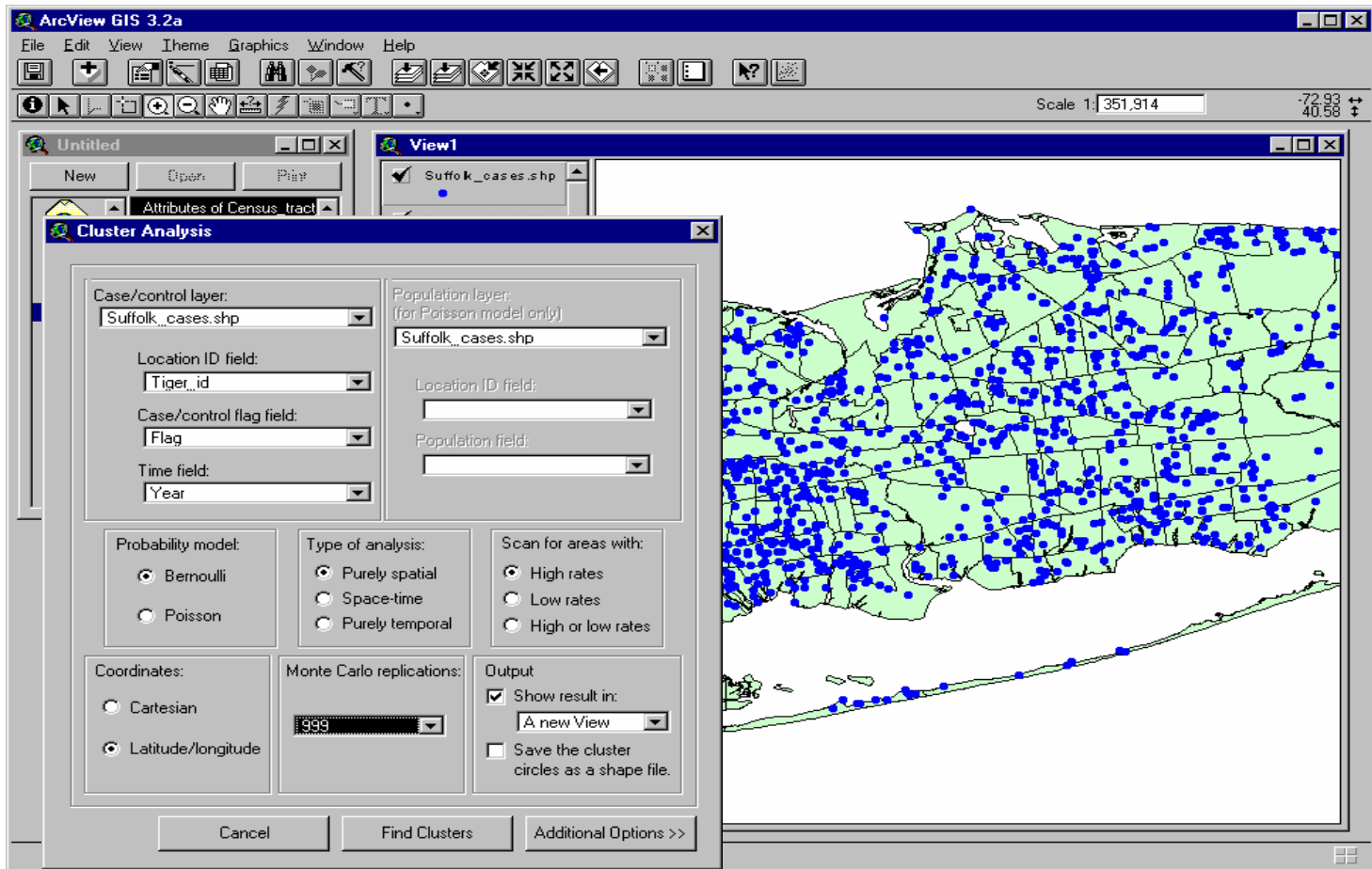




# Areal Interpolator



# Cluster Analysis



# Geographic Masking

