Deaths from Breast Cancer
ClusterSeer™ tracks national and regional trends

Breast cancer is very common, and it can be a killer. According to the National Cancer Institute (NCI), 1 in 8 women will develop breast cancer, and the lifetime risk for a woman to die of breast cancer is about 4% (Ries et al. 1994).

The causes of breast cancer are not well understood. A small proportion of breast cancers can be explained by genetics. Exposure to estrogen or estrogen-like pesticide has also been named as a risk factor.

What is clear is that there are geographic patterns in breast cancer cases, and the analysis of these patterns can help us develop hypotheses about risks and focus investment in research and intervention on the most significant areas.

Space-time Patterns
How has mortality from breast cancer changed over geographic space and time? Is the incidence of breast cancer increasing over time in certain areas? To answer these questions, we went online to the NCI Atlas of Cancer Mortality and obtained mortality rates by state for 5 year intervals from 1950-94. For analysis details see the reverse side.

We found that breast cancer mortality is rising and is indeed clustered in certain locations. ClusterSeer found significant space-time clusters in breast cancer in the Northeast 1975-94, Florida 1975-94, and the Midwest 1980-94. These regions showed statistically significant excesses in breast cancer mortality during those time periods.

Spatial Patterns, Northeast 1970-94
Once we identified space-time clusters of breast cancer mortality, we asked a second question. What are the spatial patterns within the most significant cluster? To answer this question, we used mortality rates in the years 1970-1994 for counties within the 9 states in the most significant space-time cluster. For analysis details see the reverse side .

Even within the Northeast all locations were not equal. We found significant clustering of breast cancer deaths in the area around New York City: New York, Rockland and Westchester Counties, NY and Bergen, Hudson, and Union Counties, NJ. These findings are consistent with those in another study, using different data and statistics (Kulldorff et al. 1997).

Environmental Insight
ClusterSeer identified national and regional breast cancer hotspots. All locations are not equal for breast cancer risk; geography plays a role. The next step would be to examine the spatial association between identified clusters and identified risk factors. This analysis could be done with our BoundarySeer software.

Tracking down the causes of the hotspots is the goal, and knowing where to start is part of the solution. ClusterSeer's broad repertoire of geographic and temporal analysis tools helps focus resources and time for more effective assessment and intervention.

TerraSeer™
Environmental Insight™
w w w . t e r r a s e e r . c o m

Understand.   Clarify.   Decide.

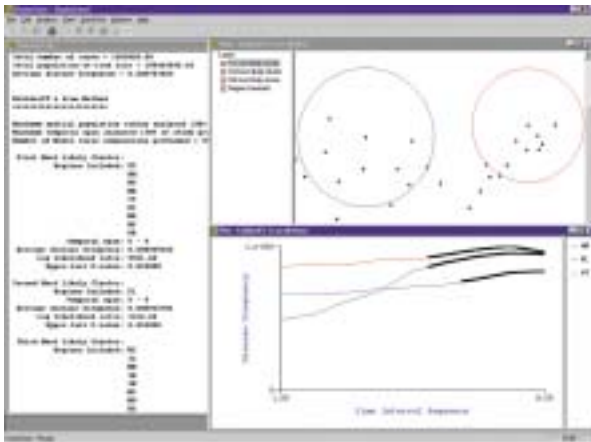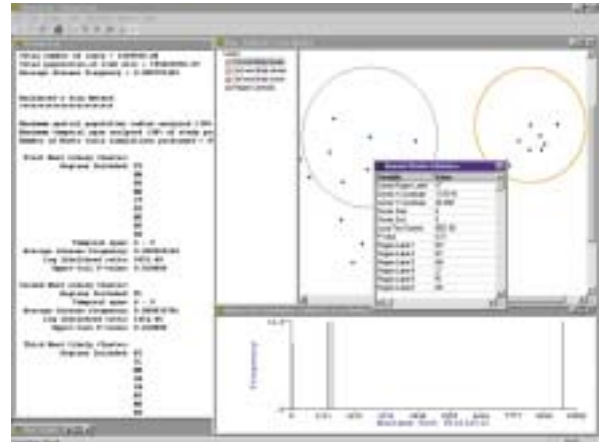# Analysis Details

Space-time Patterns

Fig.1

Fig.2

We examined space-time trends in breast cancer rates using Kulldorff's Space-Time Scan statistic. It identified 3 regions and time intervals in which breast cancer clustered. The maps above (points in circles) illustrate the extent of two of the clusters. In the plot (lower right window - Fig.1), breast cancer mortality is illustrated on the Y-axis. The lines show disease frequency for the centering regions of the clusters, with the significant time intervals in black. The topmost line is the Northeastern cluster. The Scan statistics for these regions/intervals are so extreme that the rest of the histogram (lower right window - Fig.2) appears as a single vertical line immediately adjacent to the y axis!
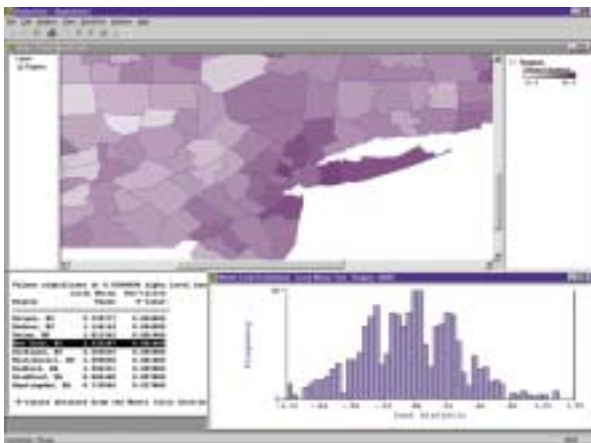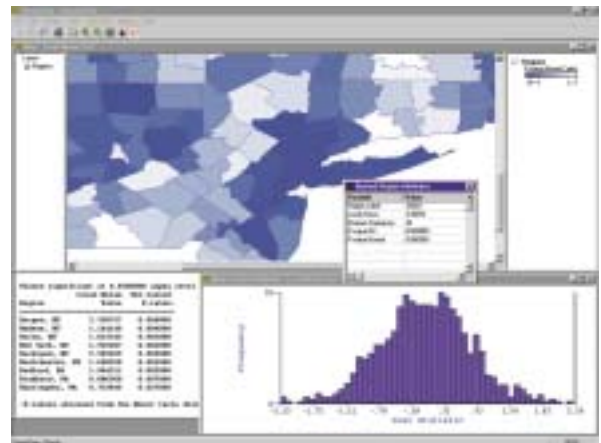
Spatial Patterns within the Northeast

Fig.3

Fig.4

The local Moran method identified significant local clusters of breast cancer within the Northeast, using the 1970-94 data. The maps show breast cancer mortality rates illustrated in purple (Fig.3) and significance in blue (Fig.4), darker indicates more deaths and higher significance.

The New York City metropolitan region had a significant cluster of breast cancer deaths. The values are extreme for the NYC area, as illustrated in histograms for Bergen county (Fig.3) and New York (Fig.4). The test statistic (thin line) is far to the right of the main distribution.

Kulldorff et al. 1997. Breast cancer clusters in the northeast United States: a geographic analysis.
Ries LAG et al, eds. SEER cancer statistics review, 1973-1991: tables and graphs. Bethesda: National Cancer Institute, 1994.
Data available from the National Cancer Institute: www.nci.nih.gov/atlasplus/