

Disparities in Female Breast Cancer Stage at Diagnosis in New Jersey – a Spatial Temporal Analysis

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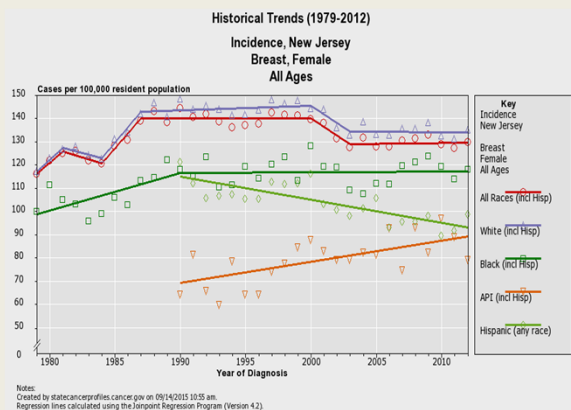
Introduction Female Breast Cancer, U.S.

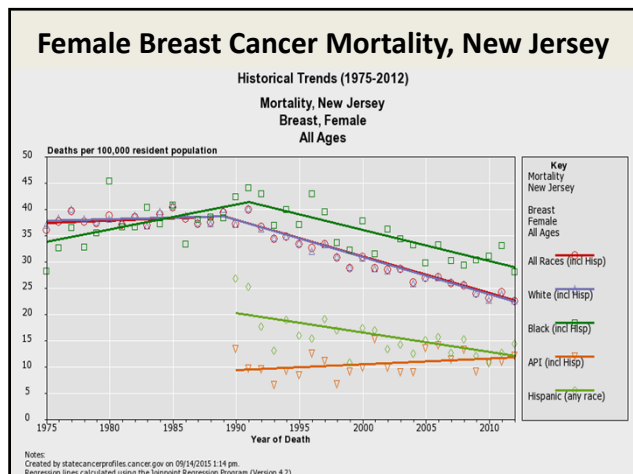
- Breast cancer is the leading cancer diagnosis and second largest cause of cancer mortality among U.S. women.
- In 2014 an estimated:
 - 232,670 new cases
 - 40,000 deaths

Female Breast Cancer Survival, U.S.

- Survival has improved greatly since 1975.
- 2003-2005 five-year relative survival rate:
 - 92% - white women
 - 79% - black women
- Stage at diagnosis an important prognostic factor, five-year relative survival rates:
 - 100% - *in situ*
 - 99% - local stage
 - 70% - regional stage
 - 13% - distant stage

Female Breast Cancer Incidence, New Jersey





Female Breast Cancer Survival, New Jersey

- Five-year relative survival rate for 2001-2005:
 - 89.7% - white
 - 88.3% - Asian/Pacific Islander
 - 87.4% - Hispanic
 - 76.4% - black
- Black women's lower survival likely related to:
 - lower percentage diagnosed at the local stage
 - lower survival rate at each stage
- Early detection through mammography increases treatment options and decreases mortality.

Purpose of Study

- Identify, map and characterize geographic areas and time periods in New Jersey with significantly high proportions of women diagnosed with breast cancer: 1) *in situ* and 2) distant stage.
- Current study expanded upon our 2002 study with:
 - 14 additional diagnosis years
 - element of time
 - search for clusters with high proportions of breast cancer diagnosed *in situ*, as well as at the distant stage.

Methods

Cases

- Primary female breast cancer cases from the New Jersey State Cancer Registry (NJSCR):
 - *in situ* and invasive
 - diagnosed in 1997-2011
 - their address at the time of diagnosis geocoded to 2000 census tract centroids
- ICD-O-3 codes – C500-509
- Exclusions:
 - ascertained by death certificate or autopsy only
 - no valid census tract

Spatial-Temporal Analysis

SaTScan space-time scan statistic to identify clusters; specifications:

- census tract level
- elliptical spatial windows, 3-year temporal windows
- Poisson model
- maximum cluster size - 50% of the population at risk
- statistical significance determined by 999 Monte Carlo simulations, $p < 0.05$
- "cases" - women diagnosed with *in situ* or distant stage breast cancer and "population at risk" - all women diagnosed with breast cancer.

Estimated clusters were mapped using ArcGIS ArcMap.

Comparisons of Cases and Populations in the Clusters vs. Rest of New Jersey

- Cases in the estimated clusters were compared with cases in the rest of NJ on:
 - clinical, demographic, socio- economic factors
 - Pearson's chi-square, $p < 0.05$
- Populations in the estimated clusters were compared with the population in the rest of New Jersey on:
 - demographic and socio-economic factors
 - data from the 2005-2009 American Community Survey, U.S. Census Bureau

Results

127,718 total cases, excluded:

- 602 ascertained by death certificate or autopsy report only
- 360 without a valid census tract

126,756 cases in the study:

- 5,951 (4.7%) diagnosed at the distant stage
- 27,181 (21.4%) diagnosed *in situ*

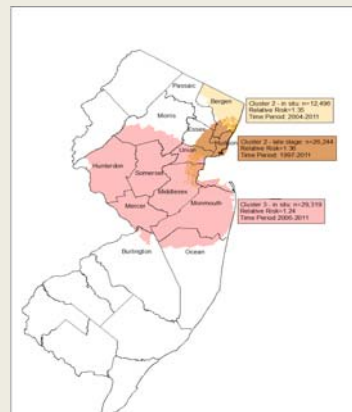
Three estimated space-time clusters were identified, one distant stage and two *in situ*.

Map with Three Space-Time Clusters

Cluster 1 (tan) - distant stage
 Geographic area - NE New Jersey
 Time period - 1997-2011
 n=26,244
 Relative Risk = 1.35, $p < 0.001$

Cluster 2 (beige) - *in situ*
 Geographic area - NE New Jersey
 Time period - 2004-2011
 n=12,496
 Relative Risk = 1.35, $p < 0.001$

Cluster 3 (pink) - *in situ*
 Geographic area - Central New Jersey
 Time period - 2006-2011
 n=29,319
 Relative Risk = 1.24



Space-Time Clusters – Distant Stage

One cluster with significantly high proportions of distant stage breast cancer (Cluster 1):

- in northeastern New Jersey
 - all of Hudson County
 - parts of Bergen, Essex, Union, Middlesex and Monmouth counties
- during 1997-2011
- relative risk = 1.35, $p < 0.001$
- 1,613 cases diagnosed at the distant stage
 - 6.1% of all cases in the cluster
 - 27.1% of the distant stage diagnoses statewide

Case Comparison Cluster 1 (Distant Stage)

Cases in Cluster 1 compared with cases in the rest of New Jersey were significantly:

- younger (0-44) or older (65+), black, Asian and Pacific Islander, Hispanic, not married and uninsured or Medicaid insured
- more likely to reside in a high poverty census tract (20-100% of residents in poverty)

Population Comparison – Cluster 1

The population in Cluster 1 compared with the population in the rest of New Jersey had **higher** percentages of persons who:

- are black, Hispanic, foreign born, unmarried, speak Spanish or an Indo-European language at home, speak English less than well, do not have a high school education
- are unemployed, in renter occupied housing, have a family income below poverty

The population in Cluster 1 has a **lower** per capita income.

Space-Time Clusters – *In Situ*

Two estimated clusters with significantly high proportions of *in-situ* breast cancer, Cluster 2 and Cluster 3:

- Cluster 2 in northeastern New Jersey (Bergen County)
- during 2004-2011
- relative risk = 1.35, $p < 0.001$
- 3,195 cases diagnosed *in situ*
 - 25.6% of all cases in the cluster
 - 11.8% of all the *in situ* cases diagnosed statewide

Space-Time Clusters – *In Situ*

- Cluster 3 in central New Jersey
 - all of Union, Somerset, Mercer, Middlesex, Monmouth counties
 - most of Hunterdon County
 - parts of three other counties
- during 2006-2011
- relative risk = 1.24, $p < 0.001$
- 6,894 cases diagnosed *in situ*
 - 23.5% of all cases in the cluster
 - 24.4% of all the *in situ* cases diagnosed state-wide

Case Comparisons Clusters 2 and 3

Cases in Clusters 2 and 3 (*in situ*) compared with cases in the rest of New Jersey:

- significantly **lower** percentages were older (65+), black, Hispanic, not married and uninsured or Medicaid insured, reside in a high poverty census tract (20-100% of residents in poverty)
- significantly **higher** percentages were API

Population Comparisons – Clusters 2 and 3

Populations in Clusters 2 and 3 (*in-situ*) compared with the population in the rest of New Jersey:

- **lower** percentages are black, Hispanic, have less than a high school education, are not currently married, unemployed, in renter occupied housing, have a family income below poverty
- higher percentages are foreign born, speak Indo-European or API language at home, speak English less than well
- have a **higher** per capita income.

Discussion

Distant Stage Cluster

Current study's distant stage cluster:

- covers approximately the same geographic area as the two clusters in earlier study
- has high percentages of minority and low SES cases and populations similar to the two earlier clusters
- the gap in % diagnosed distant stage has narrowed:

Study	Diagnosis Years	% Diagnosed at	
		Cluster	Rest of New Jersey
Previous	1995-1997	13%	5%
		9%	5%
Current	1997-2011	6.1%	4.7%

***In Situ* Stage Clusters**

- In New Jersey the proportion of breast cancer cases diagnosed *in situ* increased between 1997 and 2011 from 17% to 24%.
- Unfortunately, in recent years (2004-2011), certain areas of the state (southern and northwestern) have not improved as much as the *in situ* cluster areas.
- This disparity is especially noticeable in Bergen, Union and Middlesex counties where the *in situ* stage clusters overlap with the distant stage cluster.

Conclusion

- Additional attention to breast cancer education and screening are needed throughout New Jersey.
- The geographic area with a significantly higher proportion of breast cancer diagnosed at the distant stage especially needs these services.
- The demographic and socioeconomic information about this geographic area can be used to target needed services.

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