Mapping late-stage breast cancer rates for community-based cancer screening interventions

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Agenda

• Using GIS to map
• How did this project come about?
• Project goals
• Background
• What do we want to learn?
• Methods
• Results and Limitations
• Application
• Future plans
Geographic Information Systems

“Automated systems for the capture, storage, retrieval, analysis, and display of spatial data” †

Translates this...

Project Partners

Population-based cancer registry for Los Angeles County functioning within USC Keck School of Medicine

Patient Education and Outreach Center (PEOC) at USC Norris assists community-based organizations in capacity building
Project Goals

To reduce late-stage breast cancer diagnoses

To identify and present high-risk areas in Los Angeles County as spatial distribution maps

To collaborate with community-based organizations in using these maps as one resource in developing evidence-based cancer prevention and control programs
California and Los Angeles County

North Pacific Ocean

Los Angeles County
Service Planning Areas (SPA’s) in Los Angeles County

Used for planning public health and clinical services in local communities

1) Antelope Valley
2) San Fernando
3) San Gabriel
4) Metro
5) West
6) South
7) East
8) South Bay
We want to learn...

1. What GIS analysis method should we use to present geographical distribution of late-stage breast cancer diagnoses?

2. Are there areas in LAC with disproportionate number and densest concentration of late-stage breast cancer diagnoses?

3. What do we do with our findings?
CTs were ranked (tertile) and color-coded according to the proportion of late-stage breast cancer cases among all cases of breast cancer.

- **Red** CTs have the highest proportion.
- **Yellow** CTs have the lowest proportion.
- CTs with less than 5 late-stage cases were suppressed (“insufficient data”).
Results

Proportion of Late-Stage Breast Cancer Diagnosis among White Females
Los Angeles County, 1990-2006

Watch this area here!
CT Mapping: Limitations

• CT as unit of analysis
  – Arbitrary
  – Cannot distinguish variations within each CT
• Comparing proportions
  – highest proportion of late-stage cancer do not necessarily mean highest count of cases (overall or late-stage)
Kernel Density Estimation (KDE)

- Take the latitude/longitude of the diagnosis addresses
- Sum them over a radius of a predetermined size
- Color-code (shades of gray) for density values
- To account for age differences, older women were more heavily weighted than younger women
- Areas with highest density of invasive breast cancer appear **blackest** in color
- Areas belonging to the two lowest density categories were suppressed (appear white on the maps)
Late-stage breast cancer diagnoses among Latino, African-American and White women in Los Angeles County (LAC), 1990-2006

Highest levels of invasive breast cancer: areas within SPA’s
San Fernando, Metro West and South
Late-stage breast cancer diagnosis among Latino women in LAC, 1990-2006

Highest levels: areas within SPA’s Metro and East
Late-stage breast cancer diagnosis among African-American women in LAC, 1990-2006

Highest levels: areas within SPA

South
Late-stage breast cancer diagnosis among White women in LAC, 1990-2006

What do you see here?

Highest levels: areas within SPA’s San Fernando, Metro and West
Late-stage breast cancer diagnosis among White women in LAC, 1990-2006
KDE: Improves CT mapping

• Areas that appear **blackest** actually have the highest count of invasive breast cancer cases
• Removed the arbitrary CT boundaries and allowed for differentiation of high-density areas within each CT
• Accounted for effects of age by assigning older women greater weight in the analysis
KDE: Limitations

- Spatial confounding
- Concept of “cluster”
- Map presentation
- Limited capacity for spatial analysis
  - Cannot easily adjust for other potential confounders (i.e. SES, smoking)
  - Cannot test for hypotheses
  - Cannot find best predictor(s) of late-stage cancer
How can the Community benefit from these results?

<table>
<thead>
<tr>
<th>Strategies</th>
<th>Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Develop community outreach plan</td>
<td>Refocused current partnerships to increase screening in high-risk areas</td>
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<tr>
<td>Develop community-based participatory research partnerships</td>
<td>Assisted LA Basin Clinical Translation Science Institute (LAB-CTSI) in identifying key organizations in high-risk areas and linking them to researchers</td>
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<tr>
<td>Conduct demographic and health behavior research, and needs assessment in high risk areas</td>
<td>Produced the LA County community profile for Komen for the Cure (LAC affiliate)</td>
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How can the Community benefit from these results?

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<td>Disseminate data from SEER and LA Cancer Surveillance Program (CSP)</td>
<td>Shared maps and CSP data with “ACCESS for LA” Coalition at annual meeting</td>
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<tr>
<td>Develop local cancer prevention and control coalitions</td>
<td>Developed coalition in SPA 4 (Metro) with Department of Health Services as lead member</td>
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<td></td>
<td>Supported “Partnered for Progress” that reach Asians/Pacific Islanders in SPA 4 and African Americans in SPA 6 (South)</td>
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<td>Encourage use of evidence to improve breast cancer screening rates and outcomes in high-risk areas</td>
<td>Conducted trainings on use of evidence and evidence-based programs in cancer control for community organizations</td>
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<td>Partnered with Komen for the Cure to identify areas/populations for grant-making priorities</td>
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Future Plans

• Monitor geographical distributions over time
• Analyze and map distribution of other preventable cancers (i.e. cervical, colorectal, prostate and melanoma)
• Increase awareness around clinical trials with a focus on racial/ethnic minorities
Summary

**Method**
CT mapping and kernel density estimation methods (GIS) were used to present geographical distribution of late-stage breast cancer diagnoses in LAC.

**Results**
Some areas in LAC have high concentration of late-stage breast cancer diagnoses.

**Application**
Results will be used to promote use of evidence and evidence-based programs among community partners to target high-density areas.
Questions?

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