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Abstract

Population-based cancer registry data is generally used to monitor cancer trends over time, show cancer patterns in various populations and advance clinical, epidemiologic, and health services research. In this instance, registry data was used to guide partnerships for responsive evidence-based program planning to address identified target areas.

Geographic Information System (GIS) technology can be used to understand health problems and better target areas in need of interventions. The **Patient Education and Community Outreach Center (PEOC)** at the **University of Southern California/Norris Comprehensive Cancer Center (USC/NCCC)** analyzed CSP data using kernel density estimation (KDE) to create density maps showing patterns of late-stage or invasive breast cancer diagnosis in the 8 Service Planning Areas (SPA) in Los Angeles County (LAC).

Overall, some SPAs in LAC have disproportionately high number of invasive breast cancer diagnoses with the densest areas located in Metro, South, West and San Fernando. Among Latino, Black and White women, the KDE maps show that the highest density of invasive breast cancer is concentrated in Metro and East; South; and San Fernando, Metro and West, respectively.

Findings will assist partnership development efforts to engage cancer prevention and control organizations, including those that offer treatment and clinical trials, and encourage the use of evidence-based programs, to target high-density areas identified on the KDE maps.

Relevance to Study

- > In California (CA) and LAC, breast cancer is the most common cancer among women of all racial and ethnic groups.
- > One woman in CA is diagnosed with breast cancer every 24 minutes.
- > Breast cancer is also the leading cause of cancer mortality in women younger than 65 years of age, and the second leading cause of cancer mortality in women older than age 65.
- > Because of successful intervention efforts, approximately 68% of female breast cancers are now being found at an early stage when they are most curable.
- > Early diagnosed breast cancer patients have an over 97% five-year survival.
- > Women age 50 and older who receive annual mammogram and clinical breast exam are 30% more likely to survive than those who do not receive annual screening.
- > This study analyzes the spatial pattern of late-stage presentation of breast cancer to help early screening interventions target high-risk areas.

Partnership

> The PEOC, developed by USC/NCCC and established through a capacity building partnership with the National Cancer Institute's **Cancer Information Service Partnership Office (CIS)**, partnered with the **Los Angeles Cancer Surveillance Program (CSP)**, the population-based cancer registry for LAC functioning within the USC Keck School of Medicine, to identify areas in gaps in cancer prevention, early detection, treatment, and support services in the County.

> CIS assists community-based organizations in capacity building to develop evidence-based cancer prevention and control programs.

> CSP provided the population-based cancer incidence data used in this study.

Methods

> We considered all women in LAC diagnosed with invasive breast cancer (n= 23,172) between 1990-2006.

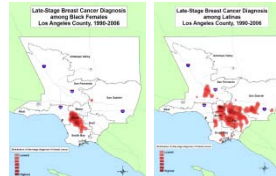
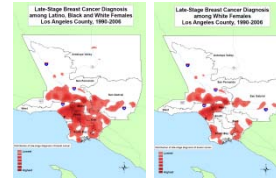
> **Kernel density estimation (KDE):** Incident cases were plotted as points on a map based on the latitude/longitude of their diagnosis address. These points were smoothed out over a radius of a predetermined size and color-coded for density values. To account for age differences, older women were weighted more compared with younger women. Areas with highest density of invasive breast cancer appear darkest in color. Areas belonging to the two lowest density categories were suppressed and appear white on the maps.

> **Census tract (CT) mapping:** CTs were ranked and color-coded in tertiles according to the proportion of late-stage cases among all cases of breast cancer, with red having the highest proportion. CTs with less than 5 late-stage cases were suppressed and were labeled having "insufficient data."

> ArcGIS 9.3.1 was used to produce the maps.

Results

A. Kernel density estimation maps



B. Census Tract map



These maps show the spatial distribution of invasive breast cancer in LAC divided by SPA:

- 1)Antelope Valley
- 2)San Fernando Valley
- 3)San Gabriel
- 4)Metro
- 5)West
- 6)South LA
- 7)East LA
- 8)South Bay

Discussion

> Overall, Metro, South, East and South Bay have disproportionately high density of invasive breast cancer diagnoses, while Metro, South, West, and San Fernando have the densest invasive breast cancer diagnoses.

> Among Latinas, invasive breast cancer cases are concentrated in Metro and East. Among Black women, the highest density is in SPA South, while the highest density among White women are in sections of San Fernando, Metro and West.

> The same pattern of low density invasive breast cancer among White women in SPA South and surrounding vicinity is observed on the CT and KDE maps (white areas). However, some CTs with highest proportion of invasive breast cancer on the CT map do not appear to have high density on the KDE map (i.e. red CT on the westernmost portion of Antelope Valley).

> Because we are comparing proportions in the CT maps, CTs with the highest proportion of late-stage disease do not necessarily have the highest number of overall or late-stage cases. In addition, each CT was color-coded as a whole regardless of where these invasive cases were concentrated within that CT.

> In comparison, areas that appear darkest on the KDE maps have the highest number of actual cases of invasive breast cancer diagnosis compared with the rest of LAC. KDE also removed the (arbitrary) CT boundaries and allowed for differentiation of high-density areas within each CT color-coded as one entire block in the CT approach.

Conclusions

> KDE improves upon the traditional CT map approach because it distributes each case of invasive breast cancer over the map surface to show different density values. In addition, it can account for effects of age by assigning older women greater weight in the analysis.

> Overall, the KDE maps show areas in LAC with disproportionate number and densest concentration of invasive breast cancer diagnoses.

> In addition, the KDE maps present high-density areas within each SPA stratified by race.

> We recommend focusing screening efforts in high-density areas identified using the KDE approach.

> The study illustrates the potential use of GIS technology to illustrate health problems and gaps in healthcare service in a user-friendly format such as spatial distribution maps.

Implications

> Results will be used in planning cancer control programs at the community-level and target areas with high density of invasive breast cancer diagnoses through USC/NCCC PEOC.

> Use of KDE may be expanded to analyze distribution of other preventable cancers such as cervical, colorectal, prostate and melanoma.

> The Susan G. Komen for the Cure, LAC Affiliate established policies to focus grant-making efforts in areas prioritized by these maps.

> Future projects: dissemination/adaptation/use of evidence-based programs in cancer control through NCI's Community Outreach Programs in Los Angeles (including increasing participation in clinical trials), developing community-based participatory research partnerships, and impact evaluation of existing early screening interventions.

Acknowledgments

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