

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

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Department of Geography

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...

FID	Shape *	ObjectID	STATE_FIPS	CNTY_FIPS	STCOFIPS	TRACT	FIPS	POP2000	POP2004	POP04_SOMI	POP04_SOMI	WHITE	BLACK	AMERI_ES	ASIAH	HAWNI_PI	OTHER	MULT_RACE	
0	Polygon	0 06	027	06027	000500	06027000500	2612	2606	1	1	1952	6	419	12	5	76	142		
1	Polygon	1 06	027	06027	000700	06027000700	636	620	0	0	521	2	70	8	4	13	20		
2	Polygon	2 06	027	000600	000600	06027000600	2479	2445	1	2	11	1973	2	183	21	1	181	118	
3	Polygon	3 06	029	06029	005501	06029005501	5685	5862	20	4	211	5119	46	82	117	6	127	188	
4	Polygon	4 06	029	06029	005300	06029005300	1873	1858	16	9	16	1296	168	29	101	20	153	106	
5	Polygon	5 06	029	06029	005401	06029005401	5567	5555	2702	4	2696	4708	140	43	243	46	199	188	
6	Polygon	6 06	029	06029	005402	06029005402	4965	4943	2457	1	2496	4119	153	36	206	31	146	174	
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8	Polygon	8 06	029	005403	002005403	06029005403	6867	6815	1751	8	1738	5728	186	95	174	23	397	264	
9	Polygon	1395 06	089	06089	012400	06089012400	3863	4143	6	2	6	3537	5	108	33	4	30	146	
10	Polygon	1396 06	089	06089	011800	06089011800	7374	7957	103	111	11	6796	56	152	45	3	93	229	
11	Polygon	1397 06	089	06105	000300	06105000300	2847	2856	4	7	4	2445	5	218	7	1	9	162	
12	Polygon	1398 06	089	06089	011600	06089011600	3526	3633	169	5	174	3153	9	124	17	4	43	178	
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33	Polygon	1419 06	089	06089	011100	06089011100	2742	3381	12	6	15	1	2564	25	46	19	2	32	54
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35	Polygon	1421 06	089	06089	012301	06089012301	2520	2867	38	2	4	3	2337	7	102	10	9	63	82
36	Polygon	1422 06	089	06089	012100	06089012100	5429	6093	83	5	9	8	4800	35	195	25	5	154	215
37	Polygon	1423 06	089	06089	012200	06089012200	4988	5047	24	2	24	2	4368	15	150	96	5	140	214
38	Polygon	1424 06	089	06089	012000	06089012000	4799	4983	11	3	11	7	4106	23	200	140	9	92	229
39	Polygon	1425 06	103	06103	000100	06103000100	4636	4922	4	4	4	4	4155	34	94	9	6	194	144
40	Polygon	1426 06	089	06089	012303	06089012303	3716	3909	130	5	13	18	3427	19	117	32	3	47	109
41	Polygon	1427 06	103	06103	000200	06103000200	3838	4110	3	1	3	2	3357	51	95	38	11	246	140

Into this...



[†]Clarke, K.C., McLafferty, S.L., & Tempalski, B.J. (1996). On epidemiology and geographic information systems: a review and discussion of future directions. *Emerging Infectious Diseases*, 2(2), 85-92.

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

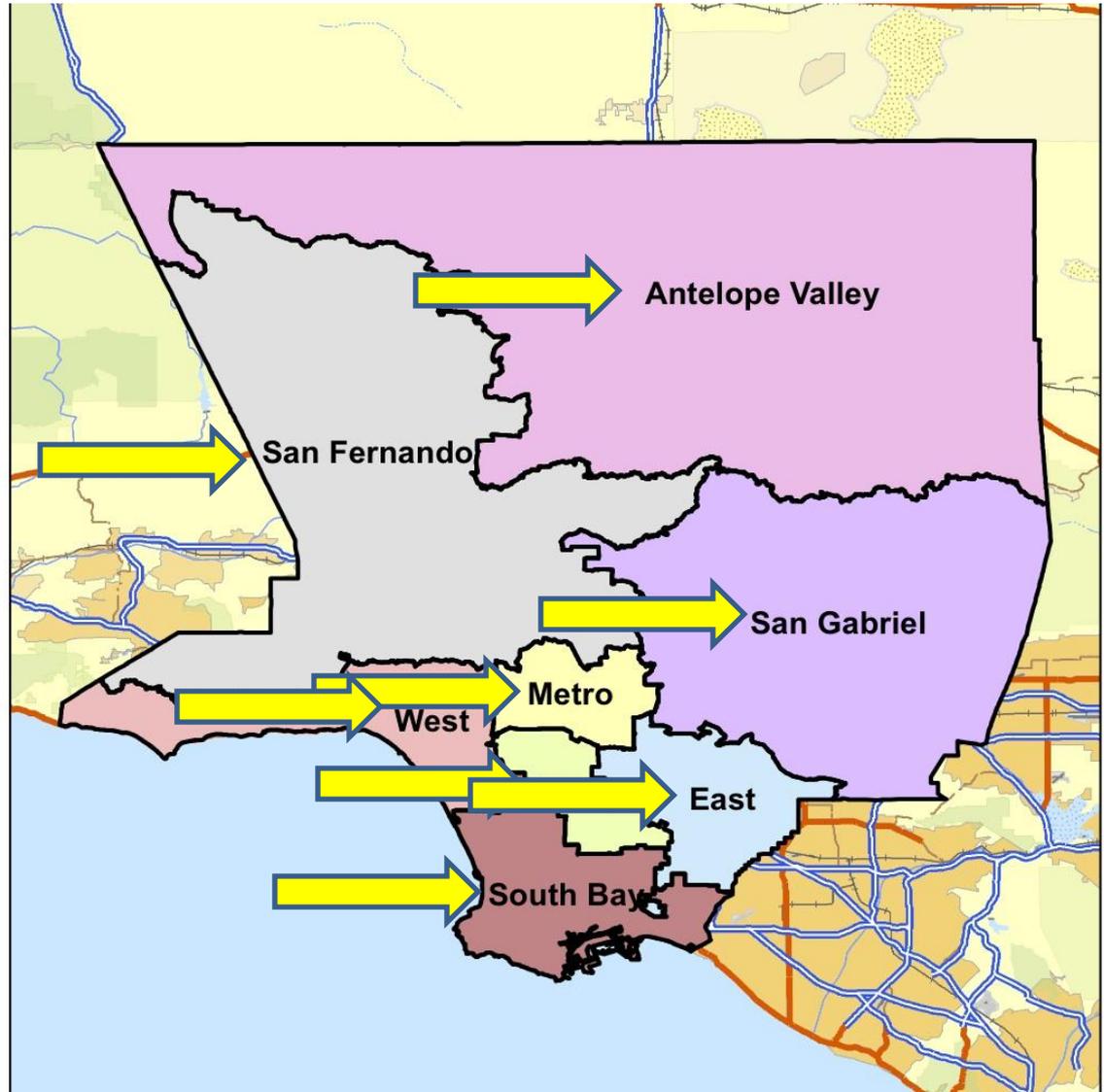
California and Los Angeles County



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...

Method

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

Results

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

Application

3. What do we do with our findings?

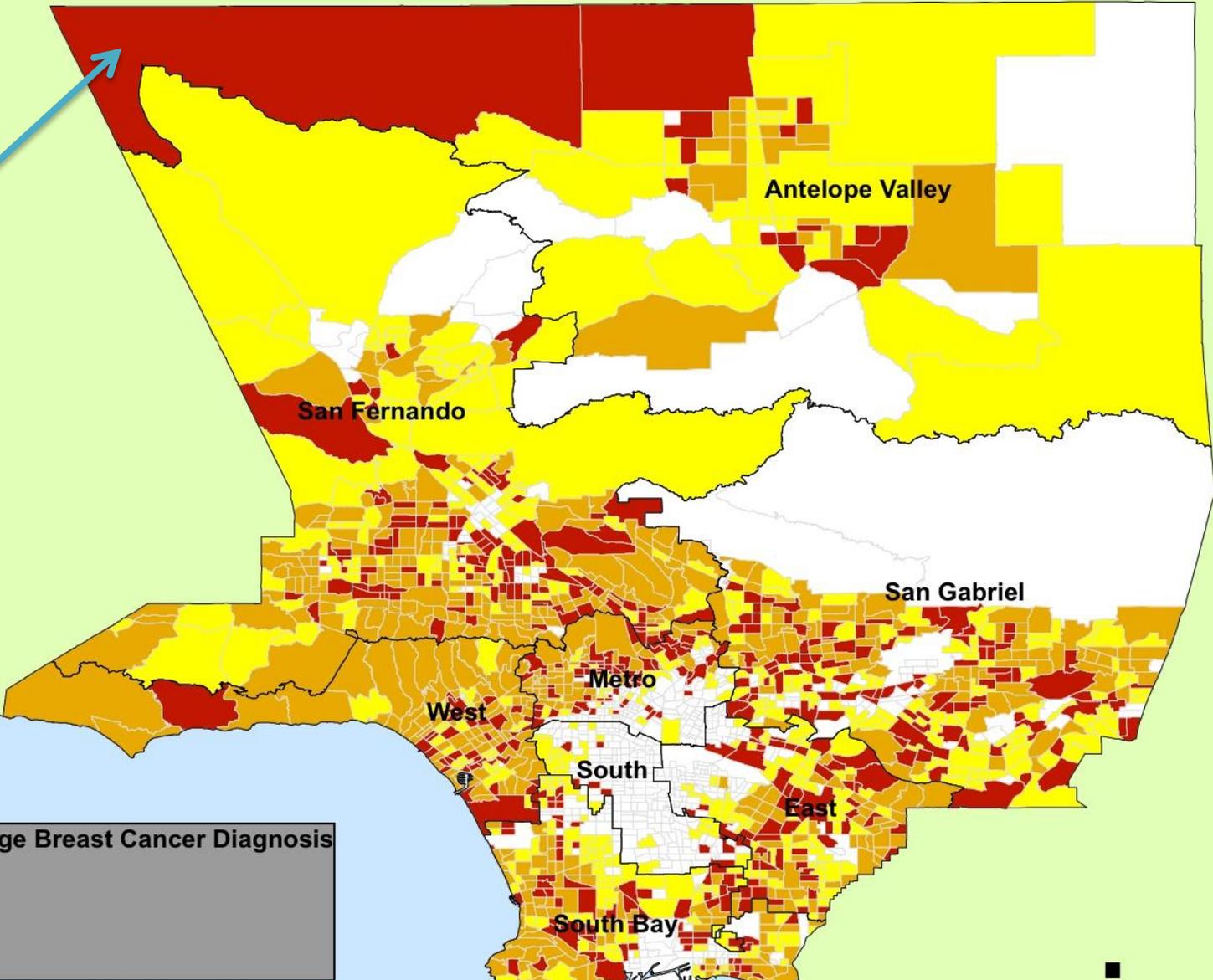
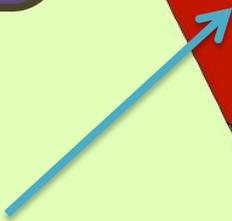
Census tract (CT) Mapping

- 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”)

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

Results

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)

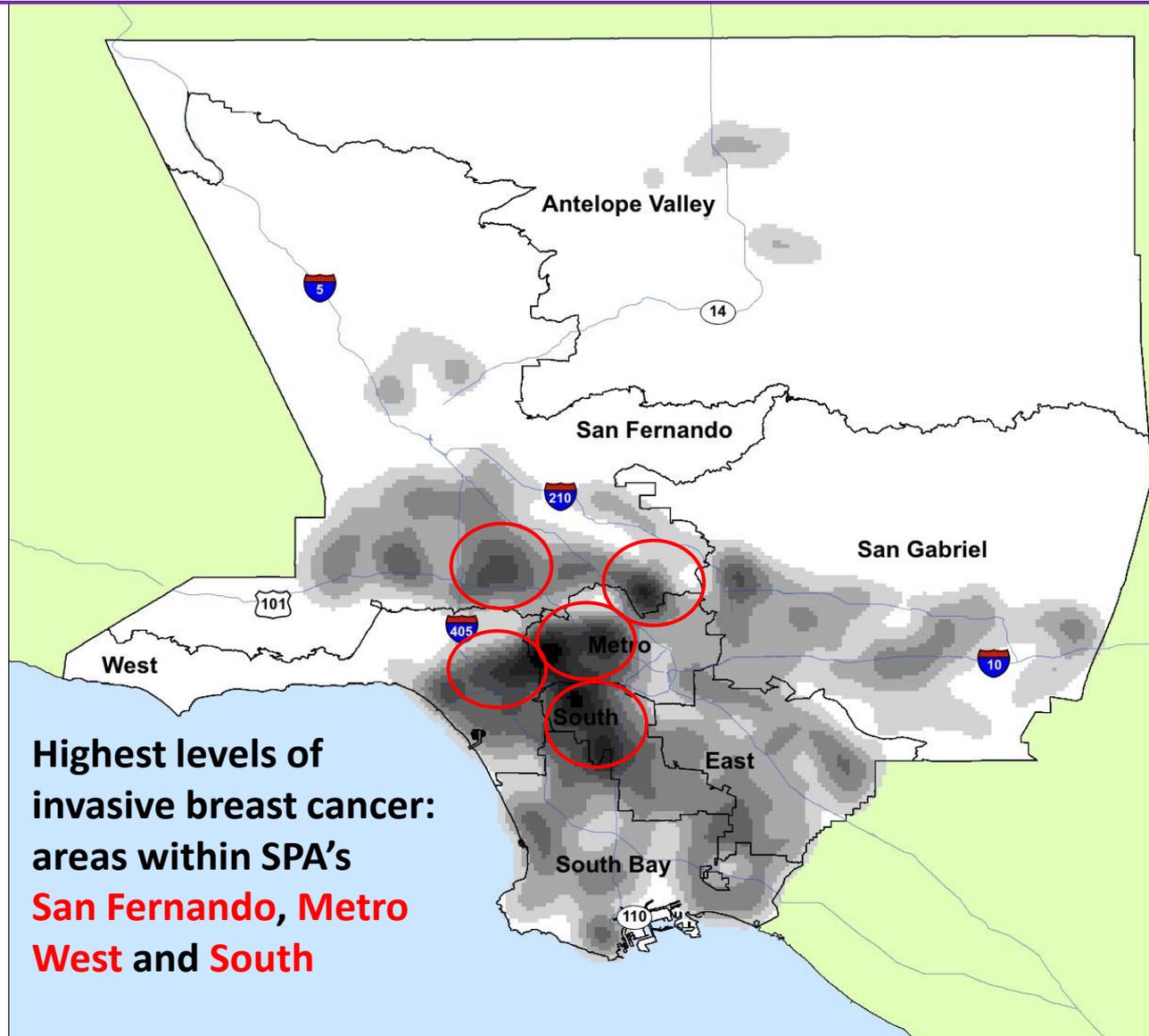
Method

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)

Results

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**

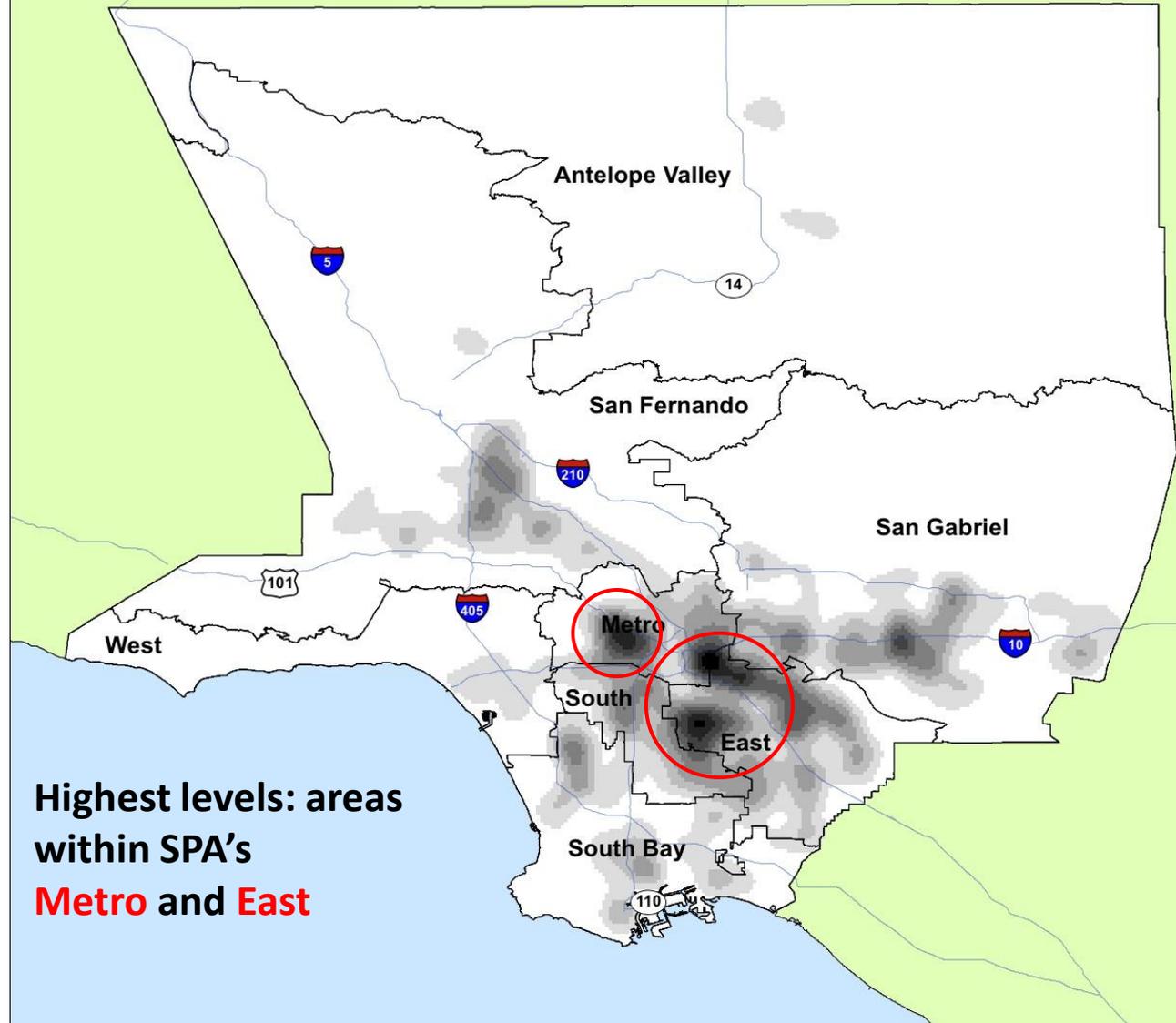
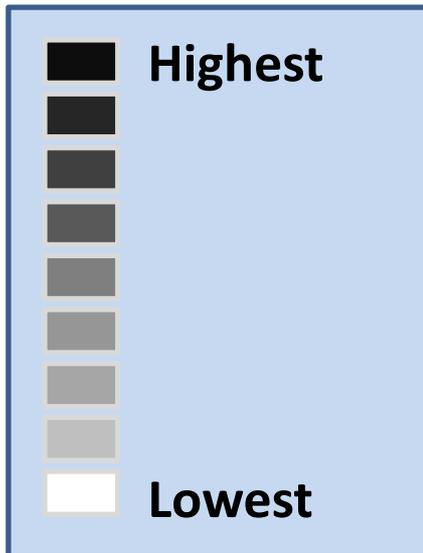
 Highest



Lowest

Results

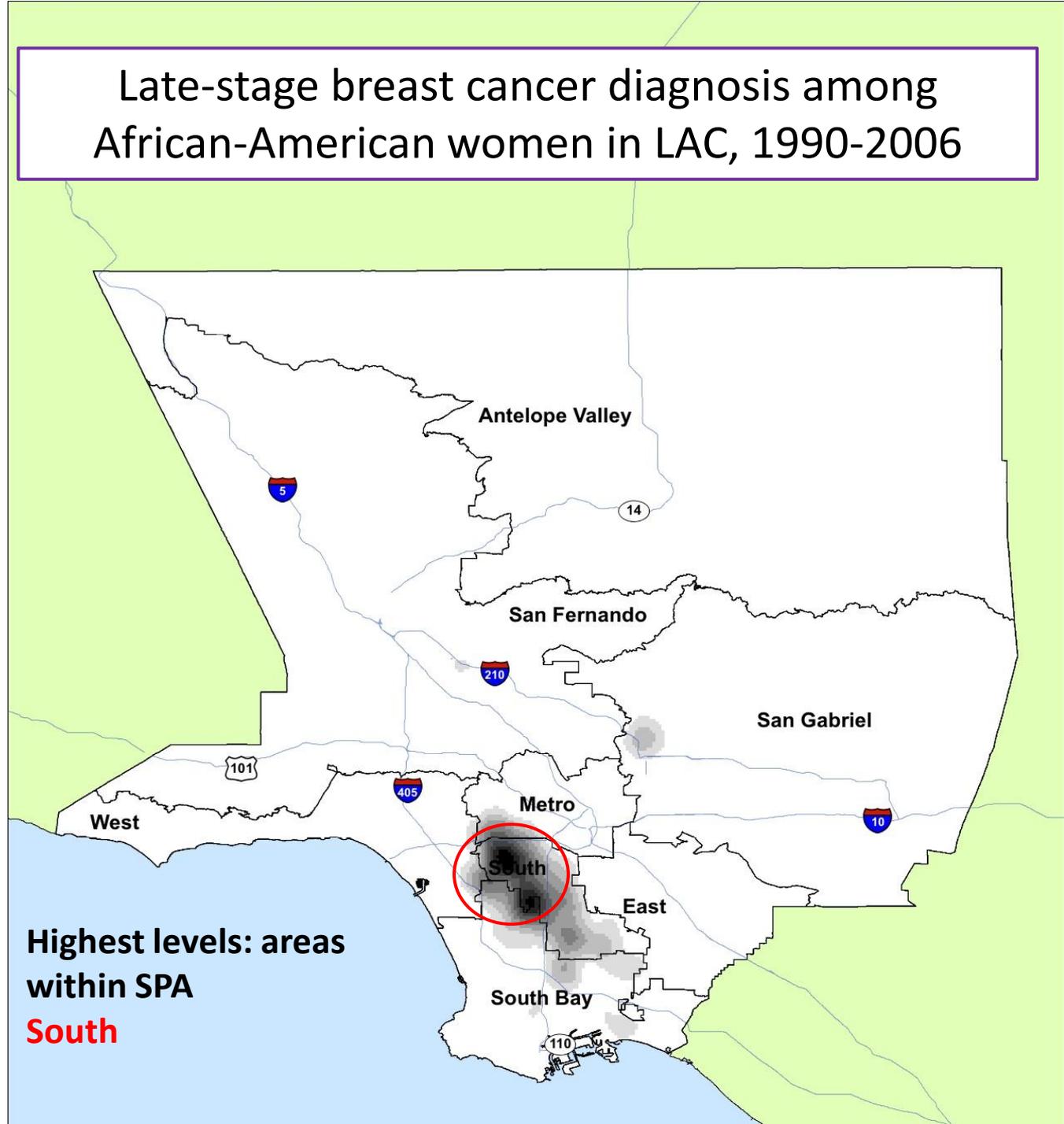
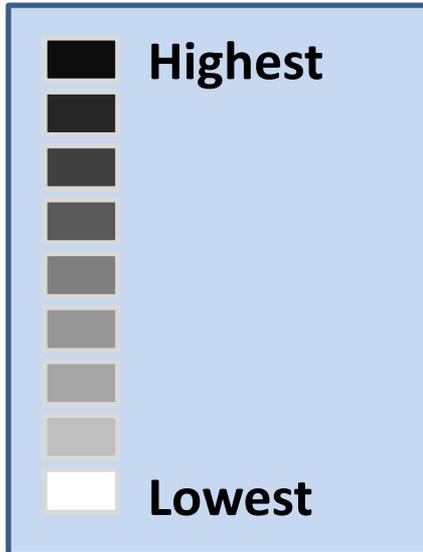
Late-stage breast cancer diagnosis among Latino women in LAC, 1990-2006



Highest levels: areas within SPA's Metro and East

Results

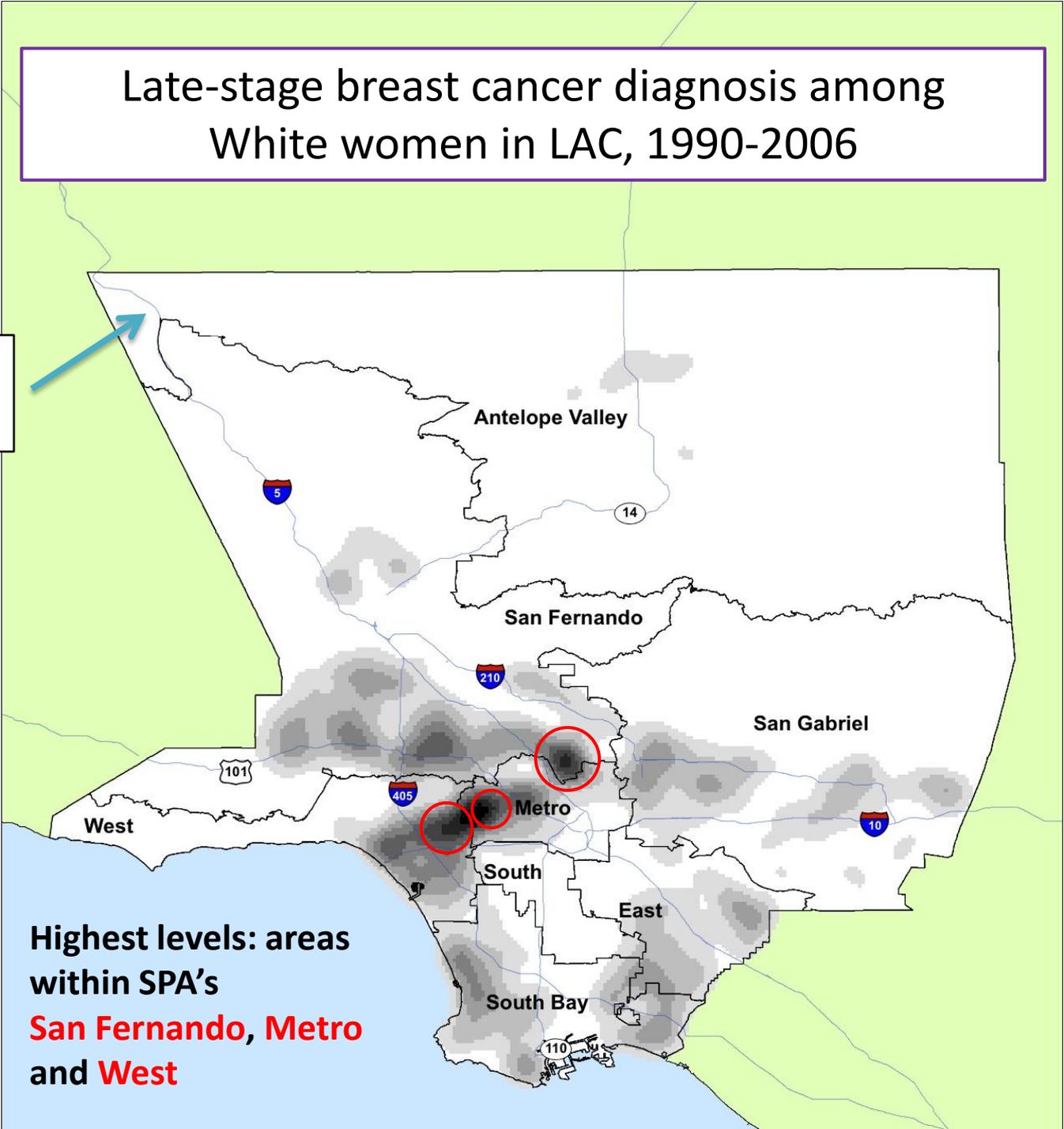
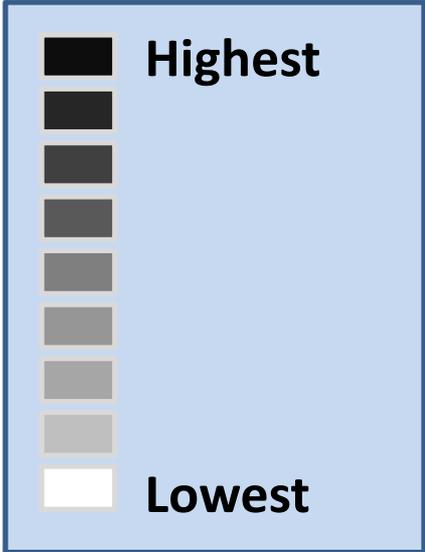
Late-stage breast cancer diagnosis among African-American women in LAC, 1990-2006



Results

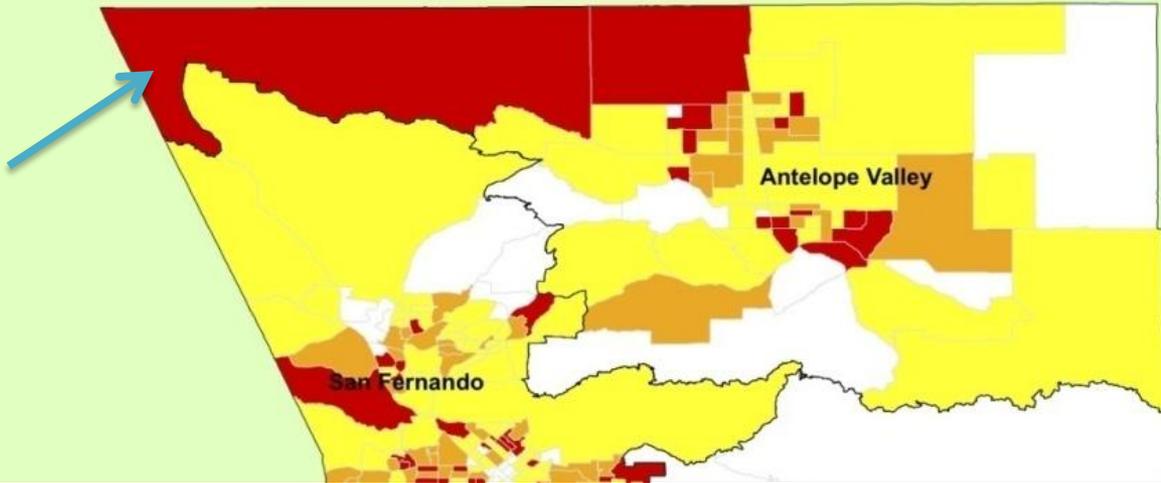
Late-stage breast cancer diagnosis among White women in LAC, 1990-2006

What do you see here?



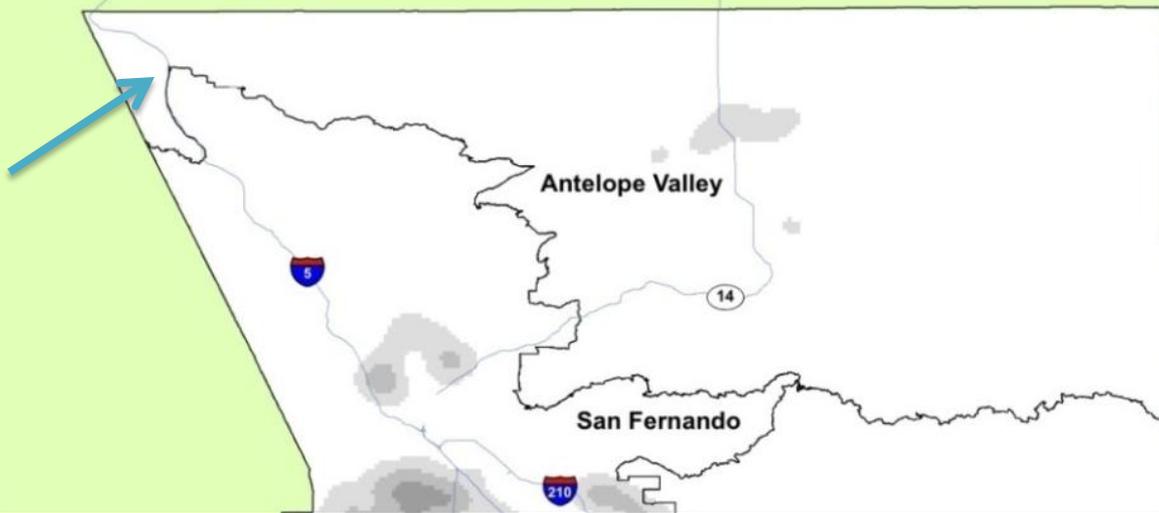
Highest levels: areas within SPA's San Fernando, Metro and West

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



CT Mapping

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



Kernel
Density
Estimation

Results

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

Application

How can the Community benefit from these results?

Strategies	Activities
Develop community outreach plan	Refocused current partnerships to increase screening in high-risk areas
Develop community-based participatory research partnerships	Assisted LA Basin Clinical Translation Science Institute (LAB-CTSI) in identifying key organizations in high-risk areas and linking them to researchers
Conduct demographic and health behavior research, and needs assessment in high risk areas	Produced the LA County community profile for Komen for the Cure (LAC affiliate)

Application

How can the Community benefit from these results?

Strategies	Activities
Disseminate data from SEER and LA Cancer Surveillance Program (CSP)	Shared maps and CSP data with “ACCESS for LA” Coalition at annual meeting
Develop local cancer prevention and control coalitions	Developed coalition in SPA 4 (Metro) with Department of Health Services as lead member
	Supported “Partnered for Progress” that reach Asians/Pacific Islanders in SPA 4 and African Americans in SPA 6 (South)

Application

How can the Community benefit from these results?

Strategies	Activities
Encourage use of evidence to improve breast cancer screening rates and outcomes in high-risk areas	Conducted trainings on use of evidence and evidence-based programs in cancer control for community organizations
	Partnered with Komen for the Cure to identify areas/populations for grant-making priorities

Application

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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