SPATIAL CLUSTER ANALYSIS OF FEMALE BREAST CANCER DIAGNOSIS IN MISSOURI: USING GIS AND SPATIAL ANALYSIS FUNCTIONS

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BACKGROUND

- Breast cancer is the most common malignancy affecting women across all racial and ethnic groups in the United States.
- In 2012, an estimated 226,870 new cases of invasive and 63,300 cases of *in situ* breast cancer are expected to be diagnosed in women in the U.S. and an estimated 39,510 women are expected to die from the disease.
- The stage at cancer diagnosis has a tremendous impact on type of treatment, recovery and survivability. In most cases, the earlier the cancer is detected and treated, the higher the survival rate.
- Various studies have indicated disparities in access to primary care, especially access to screening services like mammography for early detection.

PURPOSE

To examine the role of spatial access to health services on the probability of late detection of female breast cancer diagnosis in Missouri, taking into account access and distance to clinics and hospitals.

RESEARCH QUESTION

To what extent does spatial geographic access to diagnostic facilities have on the stage at which breast cancer is diagnosed?

METHODS

Data Sources: The main data sources were:

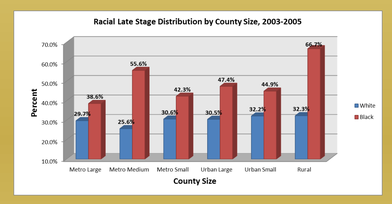
1) Cancer incidence data from the Missouri Cancer Registry and Research Center (MCR-ARC). This comprised all women diagnosed with breast cancer from 2003 to 2008.
2) American Community Survey (ACS) 2005 to 2009 population estimate. Data elements considered were total female population, education and poverty.
3) TIGER cartographic boundary
4) ESRI StreetMap
5) Health Care Facilities, including mammography screening centers.

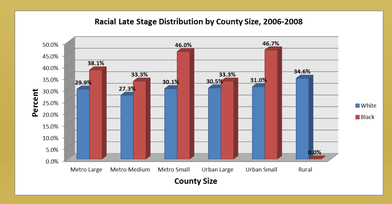
Data Techniques:

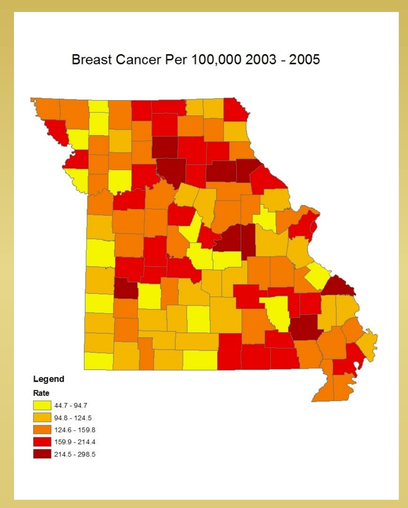
1) Surveillance Epidemiology and End Results (SEER) summary staging categories were used. Early stage refers to *in situ* and localized while late stage refers to regional and distant stages.
2) The Rural Urban Continuum Code (RUCC) was used to categorized all counties into rural-urban type.
3) County educational and poverty score were computed for each county.
4) Geostatistical analysis was used to calculate proportions of late-stage diagnosis in each county.
5) Addresses of all clinics and hospitals were geocoded and used to calculate patient travel time from one provider to another.

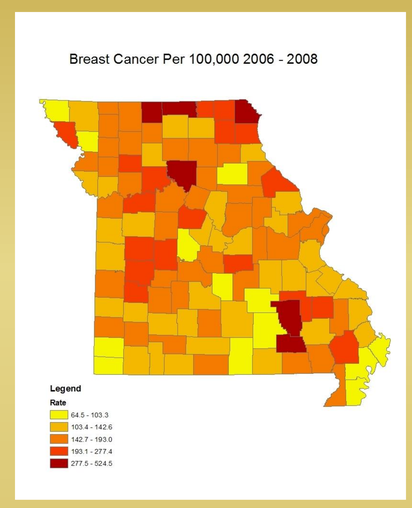
RESULTS

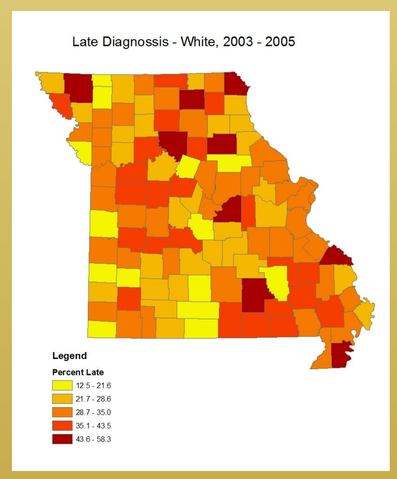
The figures below show the geographic distribution of late-stage female breast cancer in Missouri from 2003-2008.

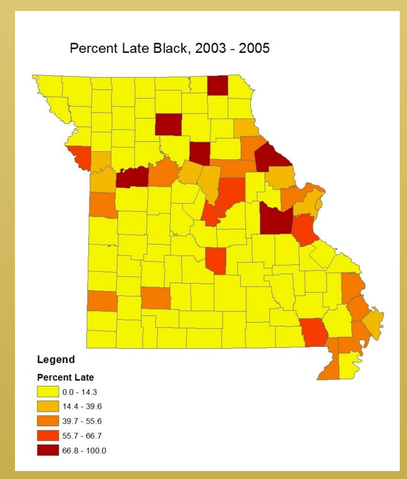


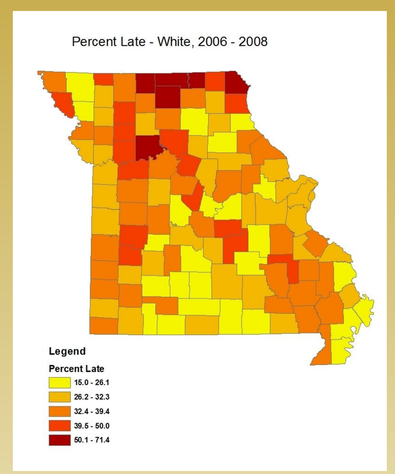


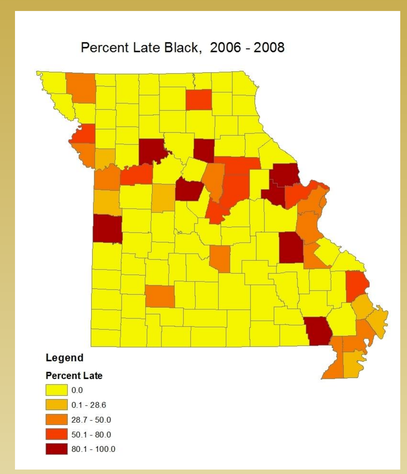




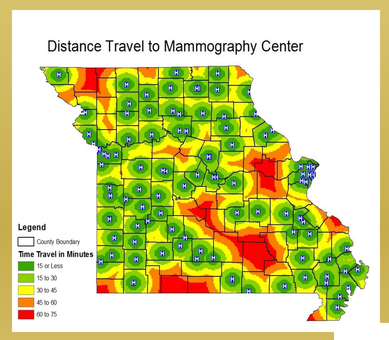




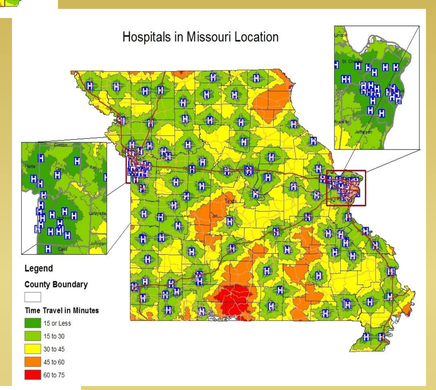


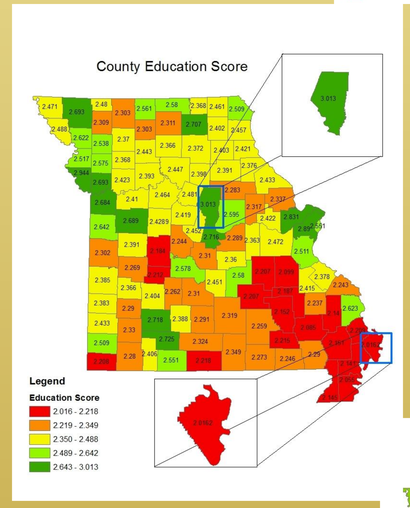


The maps below also show travel time as well as county educational and poverty scores.

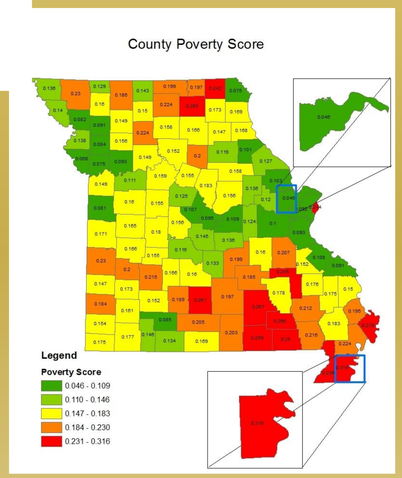


- Between 2003 and 2008, a total of 29,410 female breast cancers were diagnosed.
- Of these, 19,690 (67%) were early, 8,846 (30%) were late and 874 (3%) were unknown stage.





- Proportion of blacks with late-stage detection exceeded that of whites in almost all rural-urban type.
- A large geographic variations exists in proportion of women diagnosed in the stage.
- While there are almost 180 screening centers across the state, access to these services is not evenly distributed.
- The network analysis of closest facility showed that the travel distance to healthcare providers varies from less than 15 minutes to 75 minutes.



CONCLUSION

Women living in areas with limited access to health care services are more likely to be diagnosed with late-stage cancer.

LIMITATIONS

- Race was limited to only white and black.
- Unknown stages were excluded from the analysis.

REFERENCES

American Cancer Society. *Cancer Facts & Figures 2012.* Atlanta: American Cancer Society, 2012.

Wang, F, McLafferty et al. Late-stage breast cancer diagnosis and health care access in Illinois. *Professional Geographer,* 2008 February; 60(1), 54-69.