Category: Data Analysis – Work in Progress – Faculty

Using Enhanced Two-Stage Catchment Area Analysis to Plan Mobile Lung and Breast Cancer Screening Placement: Oklahoma 2024

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1. Background

Among all cancer types, lung cancer causes the most deaths. Among women, breast cancer is the leading cause of cancer. Mobile screening vans are crucial in improving access to cancer screening, especially for underserved and rural communities. They bring life-saving breast and lung cancer screening services directly to areas where health care facilities may be scarce or difficult to access. Early detection through mammography or low dose computed tomography significantly improves survival rates and the mobile vehicle approach helps reduce disparities by reaching populations that face barriers, such as limited transportation, financial challenges, or busy schedules.

2. Goals

The goal of this project is to locate and, thus, allow us to target areas in the state with large numbers of people without geographic access to mammography or lung cancer screening and to plan the optimal locations to deploy mobile mammography and lung cancer screening vans.

3. Solutions and Methods

For lung cancer screening locations, we used the American College of Radiology Lung Cancer Screening Locator Tool, geocoded using Esri's ArcGIS World Geocoder. For mammography screening locations, we used the U.S. Food and Drug Administration (FDA) mammography facilities database to identify facility locations, again using World Geocoder. Population estimates were collected for 2017-2022 using the U.S. Census by block groups. For lung cancer, the estimated population is aged 50-80, weighted by the percentage of cigarettes used by the county for 2016. We used the gravity-based enhanced two-step floating catchment area (E2SFCA) analysis in ArcGIS to locate areas of highest need.

4. Outcomes

238,000 Oklahomans overall need lung cancer screening. In October 2024, 18 accredited fixed lung cancer screening locations were in Oklahoma. These are scattered throughout the state, with large areas in both rural locations that lack ready access to lung cancer screening. An estimated 99,604 screen-eligible persons were located in an area without geographic access to lung cancer screening services within 30 minutes.

An estimated 941,000 Oklahoma women need breast cancer screening. In October 2024, there were 117 fixed mammography facilities in Oklahoma. Among those, 29 were in Indian Health Service, Tribal, or Urban Indian facilities, and one was in a military facility. Expectedly, urban areas were better covered; however, some large rural areas were also well covered. Large areas of rural Oklahoma, including some suburban areas, lack ready geographic access to fixed mammography services

5. Lessons Learned and Future Directions

Mobile breast and lung cancer screening is critical for reaching underserved communities, particularly in rural areas. Our next steps are to determine where screening rates are highest and lowest by geographic area and to determine where mobile vans are currently screening, thus allowing us to deploy vehicles to

locations with the highest need for mobile screening services. Additionally, we plan on refining our model to represent better the need for lung and breast cancer screening in Oklahoma.

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