Lung cancer is the leading cause of cancer deaths. Early detection is particularly important for non-small cell lung cancer (NSCLC) patients as treatment options become limited for advanced stages of NSCLC. Understanding the geographic and temporal variations of stage-specific cancer incidence may provide meaningful information to help minimize disease progression and maximize chance of survival.

**Introduction**

- Lung cancer is the leading cause of cancer deaths.
- Early detection is particularly important for non-small cell lung cancer (NSCLC) patients as treatment options become limited for advanced stages of NSCLC.
- Understanding the geographic and temporal variations of stage-specific cancer incidence may provide meaningful information to help minimize disease progression and maximize chance of survival.

**Methods**

- **Study Design:** Ecologic study.
- **Data Sources:** New York State Cancer Registry (NYSCR) data1 retrieved from SEER*Stat software2 for 62 counties during 22 years (1995-2016).
- **Outcomes:** County-level age-adjusted incidence rates for NSCLC (all-stage, and by three stages: local, regional, and distant).
- **Covariates:** County level socioeconomic index (Yost index),3 a time-dependent composite score based on Median household income, Median house value, Median rent, Percent below 150% of poverty line, Education index,4 Percent working class, and Percent unemployed.
- **Statistical Methods:** High/low incidence clusters identified using SaTScan™ with normal model.5,7
  - Space-only model, weighted by 1/Standard error of the age-adjusted incidence rate).
  - Space-time model, adjusting for Yost Index.
- **Visualization:** Mapped counties of high/low incidence clusters along with the location of lung cancer screening registry facilities (as of Feb, 2019).8

**Results**

- **Figure 1.** High/low clusters of all-stage NSCLC, space-only model (p<0.001).
- **Figure 2.** High/low clusters of all-stage NSCLC, space-time model, (p<0.001).
- **Figure 3.** High/low clusters of stage-specific NSCLC, space-only model (p<0.01).
- **Figure 4.** High/low clusters of stage-specific NSCLC, space-time model (p<0.01).

**Key Findings**

1. Significant (p < 0.01) high/low incidence clusters were detected, with variations seen in the cluster sizes and locations between all-stage vs stage-specific models.
2. Variations of high/low clusters were also found in the space-only vs space-time models.
3. Regardless of cancer stage, the most likely high-incidence area occurred in the northeast section of the state, while low-incidence cluster around the New York City metropolitan area.

**Implications:**

- Cancer prevention strategies for NSCLC may be benefited from a refined approach that meets the needs of a specific geographic region, as there are substantial geospatial variations in the stage-specific incidence rate.
- For example, implementation of mobile lung cancer screening units in areas with high incidence rate but low lung cancer screening facilities, in order to increase early detection, and reduce disparities.

**Future steps:**

- Modeling the geospatial variation using different geospatial and temporal scales.
- Identifying risk factors other than socioeconomic status.
- Identifying high/low cluster of stage-specific mortality rate.

**References:**