**Abstract:**

In the United States, lung cancer has the second highest incidence rate and the highest mortality rate of any cancer. This study investigated county-level spatial and temporal trends of four lung cancer histologic types in the state of Texas between 1995 and 2015. The results were then published on an online interactive dashboard for the purpose of assisting public health officials in the allocation of state funds. A combination of the Bernardinelli and Leroux models was used to find the relative risk (smoothed version of SIR) for each county in each year of the study. Implementation was by R’S INLA software, which is a faster alternative to MCMC sampling for Bayesian models, conducted via a Laplace approximation of the marginal posterior distribution. Although most lung cancer types have been trending downward in recent years due to decreased smoking use, adenocarcinoma has seen a rise in the last 20 years, driven mostly by females. The areas of the highest modeled relative risk for all years of the study tended to be in the eastern region of the state. While there were no significant associations between relative risk and county-level poverty rate, there were some between relative risk and rurality. The more metropolitan that a county was, the higher its risk, relative to the rest of the state, to lung cancer.

**Introduction:**

The diagram on the left shows where a lung cancer tumor may grow and why i

Lung cancer is the leading cause of cancer mortality in the world, with many people dying due to late-stage diagnoses. As a result, it has become increasingly important to determine sub-populations and area-types that have an increased risk for the disease. In the United States alone, approximately 228,280 people are projected to be diagnosed with lung cancer in 2020.

The goal of this study was to model the spatial (across different counties), temporal (over time), and spatiotemporal relationships of lung cancer across the state of Texas. In addition, COVID-19 and other socioeconomic factors were investigated to determine any kinds of associations. All cancer data was from the Texas Cancer Registry and processed via the SEER\*Stat software.

**Methods of Analysis**:

Analyzed the census data and then used that to calculate the SIR’s. I determined the histologic codes that would be included in the analysis. Literature review about how it’s so good, anyone who is diagnosed with lung cancer. Only those with a microscopic confirmation of lung cancer were included in the study.

**Results**: data table with confidence interval values. Rurality plot and poverty plot from dashboard, temporal trends, modeled SIRs, temporal trends, modeled RR v SIR to show why it’s important for like Polk county? On average, Andrews County has about 1-2 cases, so the SIR fluctuates a lot even though the sample size is small, which is why it’s important to use relative risk because it’s not affected by these meaningless changes. In 1996, Andrews had 0 cases, so the SIR drops to 0, and then back up to 0.79 the year after when there are 2 cases.

**Conclusions**: From the spatial trends map, it appears that there are several regions in Eastern Texas with abnormally high risks to lung cancer, notably Polk and Lamar counties. Although squamous cell cancer’s (highly associated with smoking) prevalence in Texas has decreased, adenocarcinoma’s has increased, with the rise being driven mainly by women.

**Discussion**:

**Future Directions**:

It’s important to determine the counties in Texas that are most at risk for lung cancer for state public health officials to efficiently allocate funds and diagnostic resources to the appropriate demographic groups and counties. Currently, hospitals and health professionals are being inundated by the novel COVID-19 pandemic, meaning many oncology clinics aren’t functioning at their normal levels. It would be of interest to investigate lung cancer and the virus alongside one another to determine how they not only affect patients but also health institutions at a macroscopic level.

Investigating the spatiotemporal patterns of lung cancer will also help set the groundwork for further analyses in high-incidence areas. In addition, this work may open the gates for establishing causal relationships. Previous literature has pointed to alternative potential causes of lung cancer – farming pesticides, mining, air pollution, radon, and asbestos – but none of these have been thoroughly investigated. This research project was limited in that it was focused on county-level characteristics. This is problematic because people with very different lifestyles can live in the same county. Future work should attempt a point-level analysis where specific lung cancer cases or neighborhoods can be studied alongside detailed lifestyle and air quality data.