Category: Data Analysis – Work in Progress – Faculty

Exploring the Impact of Historical Redlining on Lung Cancer Incidence Rate: A Geographically Weighted Regression Analysis in the University of Kansas Medical Center Catchment Area

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1. Background

Based on the World Health Organization, lung cancer remains the leading cause of cancer-related deaths globally, accounting for an estimated 1.8 million deaths in 2020. In 2024, it accounted for about one in five of all cancer deaths in the United States, according to the American Lung Cancer Society. Significant disparities exist in lung cancer incidence across demographic groups and regions, driven by factors such as limited access to health care, higher smoking rates, and greater exposure to environmental risks like air pollution. Historically, neighborhoods in the United States were categorized by the Homeowners' Loan Corporation from 1935 to 1940 using redlining maps, which assigned grades based on housing quality, income levels, and overall economic stability. This study aims to examine whether lung cancer incidence rates differ across these historically redlined zones (Zones A to D) within the University of Kansas Medical Center's catchment area, comparing them to non-redlined counties. By analyzing these patterns, we aim to assess the ongoing impact of historical redlining on lung cancer health outcomes.

2. Goals

The primary goal of this study is to evaluate lung cancer incidence rates across neighborhoods within counties historically classified by redlining. We will first analyze lung cancer rates within neighborhoods assigned to each redlined category: A (Best), B (Still Desirable), C (Definitely Declining), and D (Hazardous) to observe incidence variations across these groups. Next, we will compare lung cancer incidence rates in redlined neighborhoods against those in non-redlined areas within the same counties to quantify health disparities and identify spatial trends. This analysis aims to highlight the long-term impact of redlining on health outcomes, providing insights that could guide targeted health interventions to address ongoing inequities in historically underserved areas.

3. Solutions and Methods

We collected spatial data on historical redlining from the University of Richmond and overlaid it with zip codes in the KUMC catchment area, which includes the greater Kansas area, Topeka, Wichita, Joplin, and St. Joseph. Lung cancer incidence data will be obtained from Kansas Health Matters. To assess the spatial variability in lung cancer incidence, we will use a Geographically Weighted Regression (GWR) model, which adjusts for socio-economic, environmental, and health care access factors. This model allows us to conduct a localized analysis of lung cancer rates, comparing redlined versus non-redlined areas and examining variations within each redlined zone (A through D).

4. Outcomes

The analysis is currently ongoing, and while we do not yet have concrete results, we anticipate that the study will reveal elevated lung cancer rates in redlined areas, particularly in Zones C and D, compared to non-redlined zones. These results will help illustrate the continuing impact of redlining on present-day lung cancer outcomes and guide efforts to reduce health disparities in marginalized communities.

5. Lessons Learned and Future Directions

This research will demonstrate the lasting effects of discriminatory housing policies on health outcomes and offer evidence for the need for health care interventions in underserved areas. The findings may

inform public health policies addressing systemic health inequities and guide future research on other health disparities linked to redlining.