Geography of Lung Cancer for Texas Counties, 1980-1998

GEOG 4120
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Lung Cancer is...

- Degenerative disease
- Ranked as number 1 leading cancer death in Texas and also US overall.
  - The incidence rate is ranked the 3rd highest, but the death rate is ranked the 1st leading cancer.
  - In Texas, approximately 66 / 100,000 people were diagnosed and 51 / 100,000 people died of cancer in 2004.
Vulnerability

• According to previous studies,
  • Particular Race/Ethnicity has higher death rate than other, and in most cases, **African Americans/black has higher death rate than white does**.
  • **Male has higher death rate than female**, but death rate among female population has been increased faster than that among male.
  • **Low socio-economic status** (low income level and low educational attainment) are related to higher lung cancer death rates among population.
Risk Factors

- **Daily behaviors, such as smoking, influence death from lung cancer.**
- **Exposure to various kinds of air pollutants increases lung cancer death rate.**
- **Living in urban area** (with higher population density) increases lung cancer death rate.
- **Intake of arsenic increases death rate from lung cancer.**
  - Arsenic is classified a group 1 carcinogen.
Framework-Human Ecology Model

- **Population Characteristics**
  - Gender
  - Race/Ethnicity

- **Behavioral Characteristics**
  - Education level
  - Income
  - Smoking

- **Habitation Characteristics**
  - Water quality
  - Air quality
  - Population density
Research Hypothesis

• Population Characteristics
  • The county with …
    *higher black population has higher lung cancer mortality rate.*
    *Male population has higher death rate than female population.*

• Habitat Characteristics
  • The county with…
    *high population density*
    *high arsenic concentration*
    *high air pollutants has high mortality rate.*
• Behavior Characteristics
  • The county with …
    high smoking rate
    low median income
    low educational attainments has higher mortality rate.
Method of the Research

- Census data - American Fact Finder
- Lung Cancer data - Texas DSHS
- Arsenic concentration –
  - Texas Water Development Board
- Air pollutants -
  - Texas Commission on Environmental Quality
- Spearman’s Rank Correlation
- ArcMap GIS software
• The county in Southeast and East area has extremely high mortality rate. On the other hand, the county in western area has lower mortality rate.
Race/Ethnicity

- % Black population is positively related.
  - $(r = .336, \text{ and } q=.000)$
- % Hispanic population and mortality rate have negative correlation.
  - $(r= -.541, \text{ and } q=.000)$
- % White population does not have significant correlation with death rate.
Gender

• Male Mortality rate > Female mortality rate.

Age-Adjusted Death Rate
(per 100,000)

Male  Female  Total

1980-89  1990-98
Socioeconomic Status

• Household median income is positively related.
  • \((r = .234, q = .000)\)

• The population attained less than 9\(^{th}\) grade has negative correlation.
  • \((r = - .192, and q = .002)\)

• The population attained 9\(^{th}\)-12\(^{th}\) grade and high school has positive correlation.
  • \((9^{th}-12^{th} \quad r = .200 \text{ and } q = .001)\)
  • \((\text{High school} \quad r = .173 \text{ and } q = .006)\)
Smoking

- Smoking rate has no significant correlation with lung cancer death rate.
  - \((r = -0.091 \text{ and } q = 0.145)\)
  - Population with higher income and higher education has higher smoking rate.
Habitat factors

- Air pollutants (volatile organic compounds, nitrogen oxide, and carbon monoxide) do not have significant correlations with death rate.
  - all of them have positive correlations but not significant

- Arsenic in drinking water is not related to the mortality rate.

- Population density does not have significant correlation.
  - \((r=-.055\text{ and } q=.379)\)
Conclusion

- **Black population** has higher lung cancer death rate than white and Hispanics do.
- **Male population** has higher death rate than female population.
- The area with **higher median income** has higher death rate.
- The area with **more people accomplished 9th to high school education** has higher death rate.
- Smoking rate, population density, air pollution, arsenic in drinking water are not significantly correlated in this study.
Suggestion

• Further research about environmental pollutants are needed.
• Research about health care accessibility may be helpful to understand.
• Gender differences of mortality rate may change in near feature, so the research about time change may be interesting.