

Ambient Air Pollution Exposure and Lung Cancer Incidence, Mortality, and 5-Year Survival in New York State: A Comprehensive Analysis

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BACKGROUND

- Despite geographic variation in lung cancer rates, few papers have examined micro variations between counties in the US.
- County level pollutants could influence not just incident disease risk but also risk of treatment failure and mortality.
- We analyzed spatial patterns of lung cancer in New York State (NYS) and statistically estimated the relationships between county-level ground level ozone as well as $PM_{2.5}$ concentrations and lung cancer incidence, mortality and 5-year survival.

METHODS

- Mortality, incidence and 5-year survival outcomes for 2018-2022 were obtained from the NYS Cancer Registry. Ambient pollutant concentrations ($PM_{2.5}$ and ozone) were taken from the CDC, radon levels were from NYS Department of Health and county-level socioeconomic variables were taken from the American Community Survey.
- Spatial patterns in incidence, mortality and survival were analyzed using Getis-Ord statistics to identify geographic clustering (hot vs. cold spots).
- Associations between air pollutants and lung cancer outcomes were evaluated at the county level, with adjustment for socioeconomic factors, radon levels, and adult smoking prevalence.
- Negative binomial models were used for incidence and mortality, while fractional logit models were used for 5-year survival. Spatial autocorrelation was evaluated using Moran's I. $PM_{2.5}$ and ozone were analyzed in separate models.

RESULTS

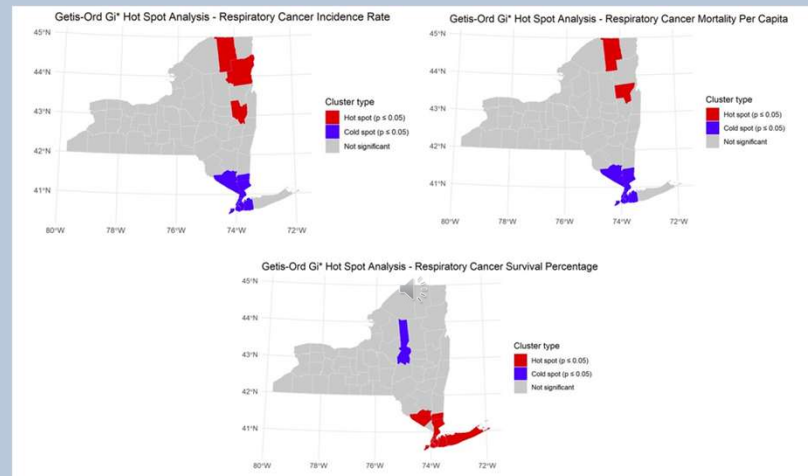


Figure 1. Geographic Clustering of Lung Cancer Incidence, Mortality and 5-year Survival Rate in NYS

	Coefficient	95% Confidence Interval	P-Value
Incidence			
$PM_{2.5}$	0.95	.89 to 1.02	0.17
Ozone	1.04	1 to 1.08	0.06
Mortality			
$PM_{2.5}$	0.93	.86 to 1.01	0.08
Ozone	1.06	1.02 to 1.10	<.01
5-year Survival Rate			
$PM_{2.5}$	1.08	.30 to 3.65	0.90
Ozone	0.99	.51 to 1.90	0.98

Table 1. $PM_{2.5}$ and Ozone vs. Lung Cancer Incidence, Mortality and 5-Year Survival Rate adjusted for county level SES, radon level and % of adult smokers
 $PM_{2.5}$ measured in $\mu g/m^3$; Ozone measured in parts per billion

DISCUSSION/CONCLUSIONS

- Significant spatial clustering was identified for incidence, mortality, and 5-year survival in New York State
- NYC and its surrounding counties represent areas where fewer incident cases/deaths are clustered and with higher 5-year survival rates than in other parts of the state.
- While counties with higher ozone exposure had higher mortality rates, mortality and level of $PM_{2.5}$ had no association.
- Neither $PM_{2.5}$ nor ozone level was significantly associated with lung cancer incidence or 5-year survival.

FUTURE RESEARCH

- As a hypothesis-generating study, these results suggest a potential association between ozone and lung cancer mortality that warrants future study across smaller geographic entities such as zip codes and in other states.
- Further investigation into the reasons for clusters of incidence, mortality and lower 5-year survival rates in upstate New York is needed. Application of this analysis across states could provide insight into this finding.