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(144530_1) - Spatial analyses reveal increased incidence of large cell lung carcinoma in specific regions of Maine that differ in men and women

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Lung cancer is a major cause of death among cancers in the US. Environmental exposures to tobacco or radon are considered the two highest risks for lung cancer. Maine is one of the top 15 states with the highest rates of lung cancer in the US, with smoking rates that vary from 20-30% across counties. We recently reported on spatial variations in radon exposure. In this study, we investigated if there were spatial regions of excessive lung cancer by gender in Maine, and if these might overlay the high radon exposure regions. Age-adjusted lung cancer incidence rates in Maine were compared to those of the US overall, using NCI SEER and CDC databases. Data for all lung cancer cases in Maine reported during 1995-2006 were obtained from the Maine Cancer Registry. Population data used Base US Census 2000 data. Lung cancer incidence was adjusted for age and population density. We assessed the spatial distribution of lung cancer by subtype, using spatial scan statistic, assuming a discrete Poisson distribution. We did not adjust for race as Maine is 95% white. We also examined spatial variations by pathology subtypes classified as adenocarcinoma, small cell carcinoma, large cell carcinoma.

Within Maine, Washington County, which also has the highest smoking rate, reported the highest lung cancer incidence rates (men: 131.7 (110.5,156.2); women: 73 (58.5, 90.5), compared to Maine overall (men: 97.2 (93.9,100.5); women: 66.6 (64.2, 69.1) or the US (men: 84.3 (84.1, 84.5); women: 55.8 (55.6, 55.9)). Maine is a rural, mostly non-agrarian state, with significant health disparities due to poverty, access to healthcare and geographic isolation. In considering other disadvantaged populations, lung cancer incidence rates for Maine men and women were higher than those reported for US Blacks, Hispanics and American Indians.

Our results showed small "hotspots" for lung cancer overall with RR greater than 1 for females (RR 1.8, p 0.03) in eastern Washington County, and for males (RR 1.7, p 0.03) in northern Washington County and in the Pittsfield Region, Somerset County. No significant differences were detected in spatial distribution for adenocarcinoma or small cell carcinoma. The most striking geospatial regions with RR greater than 1 were detected for large cell lung cancer in Washington County, one of the poorest counties in the US. Women exhibited very high rates (RR 5.3, p 0.002) along the southern coastal region of Washington County while men exhibited very high rates (RR 3.7, p 0.04) within a smaller region in northern coastal Washington county where we have mapped use of pesticide sprays. Published literature linking large cell carcinoma with smoking is ambivalent. Washington County and the Pittsfield Region have air and water radon exposures below 4 pCi. There are no heavy industry or highways that could implicate particulate matter. In conclusion, we found statistically significant spatial regions (p<05; RR greater than 1) of high large cell lung carcinoma incidence in coastal regions of Washington County, but "hotspots" for men and women differed geographically. Environmental risk factors commonly correlated with lung cancer did not appear to explain the distribution of large cell lung cancer cases. More research is needed to explain the high incidence of large cell lung cancer in a non-agrarian, mostly white population with cancer and health disparities.

Keywords: large cell lung carcinoma; spatial analyses; lung cancer

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