**Smoking, BMI, and Lung Cancer Final Report**

**Introduction:** This study attempts to better understand the impact of tobacco exposure and BMI upon death as well as the size of tumors. The study analyzes a synthetic lung-cancer data set. (2010-2024). The aim is the use of R-based visualization of information in the examination of whether or not the effect of tobacco exposure varies by the varying markers of the illness and demographics.

## Analysis

### Table 1: Summary

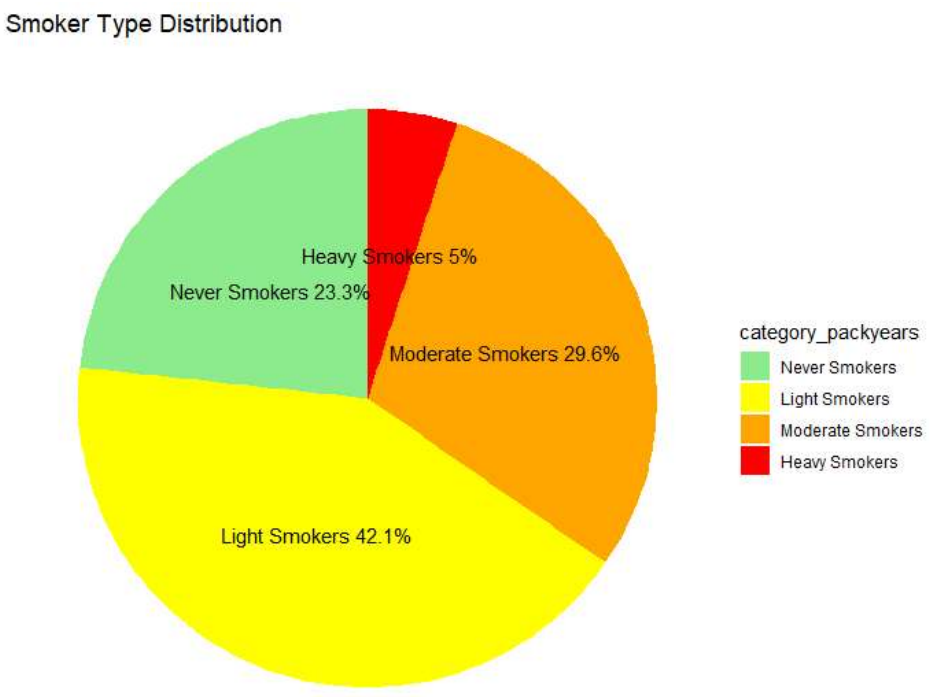
| | Overall (N=1000) |
|---|---|
| **Year Diagnosed** | |
| Median | 2017.0 |
| Q | |
| 1,Q3 | 2013.0, 2021.0 |
| Range | 2010.0 - 2024.0 |
| **Age** | |
| Median | 65.0 |
| Q | |
| 1,Q3 | 58.0, 72.0 |
| Range | 35.0 - 90.0 |
| **sex** | |
| Female | 408 (40.8%) |

| | |
|---|---|
| Male | 592 (59.2%) |
| **BMI Category** | |
| Normal | 300 (30.0%) |
| Obese | 219 (21.9%) |
| Overweight | 390 (39.0%) |
| UnderWeight | 91 (9.1%) |
| **Smoking Category** | |
| Ever | 767 (76.7%) |
| Never | 233 (23.3%) |
| **Smoking Years** | |
| Median | 14.4 |
| Q | |
| 1,Q3 | 3.9, 24.2 |
| Range | 0.0 - 82.8 |
| **Env Exposure** | |
| Median | 3.7 |
| Q | |
| 1,Q3 | 2.7, 4.7 |
| Range | 0.0 - 8.7 |

| | |
|---|---|
| **Tumor Size(cm)** | |
| Median | 5.5 |
| Q | |
| 1,Q3 | 3.9, 7.1 |
| Range | 0.5 - 12.0 |

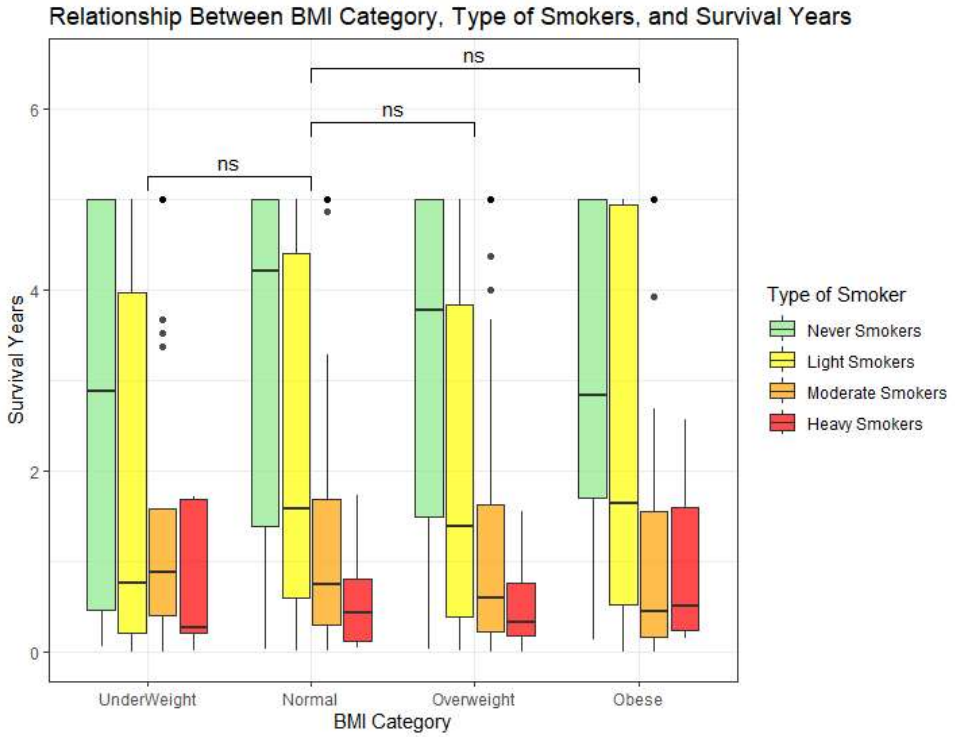
Table 1 shows descriptive attributes for the sample. The sample's median year of diagnosis was 2017 and the sample's median age was 65 years. The sample was male 59.2 percent and female 40.8 percent. 30 percent of the sample were normal weight individuals, 9.1 percent underweight, 39 percent over weight and lastly 21.9 percent that were obese individuals. Ever-smokers comprised 76.7 % of respondents. The size of tumors was 5.5 cm in the median. Moreover, the sample's median environmental exposure index was 3.7.

**Figure 1. Distribution of Types of Smokers**



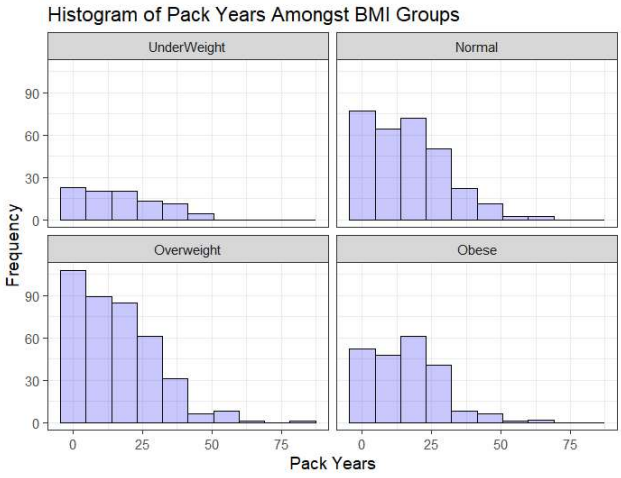

Lightest smokers most common, then moderate, never, then heavy. Most experienced low to moderate exposure. The period of exposure surpasses daily intensity.

**Figure 2. Survival in years by BMI and smoking category**



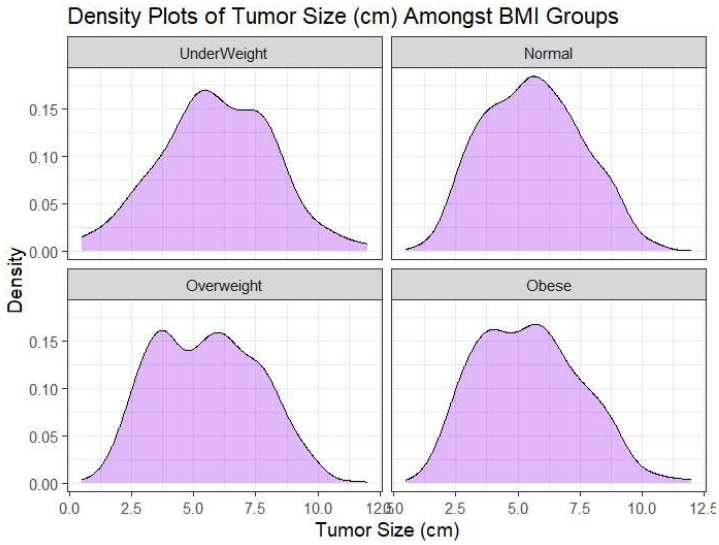

Boxplots defined the longest survival as the never-smoker's and the shortest as the heavy smoker's. Nonsignificant BMIs reaffirmed the main predictor of outcome as being smoking.

**Figure 3. Smoking Years by Categories of BMI**



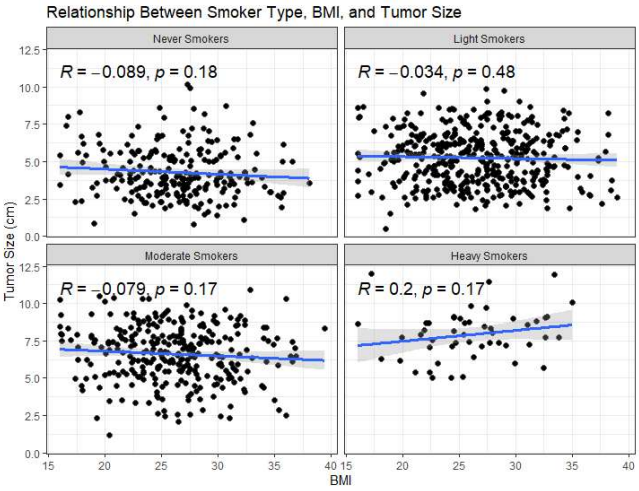

Histograms yielded right-skewed distributions for pack-years in all the groups of BMI, and most participants had low accumulated exposure with very few having over 50 pack-years. Smoking intensity was thereby independent of body weight.

**Figure 4. Distribution of Tumor Size by BMI Category**




Density plots indicated the presence of two major groupings at 4-6 cm as well as at 7-9 cm. The obesity group and the overweight group had trends toward larger tumors, but extensive overlap among groups was present, so that the BMI has relatively small effect toward tumor volume.

**Figure 5. Body Mass Index by Tumor Size in Smoking Categories**




Scatterplots revealed weak, non-significant correlations of the BMI with the tumor size in never, light, and moderate smokers, and in a weak positive correlation in heavy smokers in the positive direction (R = 0.2, p = 0.17). The risk for the tumor size was not significantly predicted by the BMI, although heavy smoking modestly increases risk in the higher-BMI.

**Conclusion:** Smoking exposure remains the better predictor of poor outcome in lung cancer, and BMI has minor impact. Selective heavy smokers exhibit lowest survival and very slightly larger tumors. The study points to smoking abstinence as absolutely crucial future public health action. Future studies ought to find effective treatments to prevent smoking in adults.

Islami F.et al.2015. Global trends in lung cancer mortality and smoking prevalence. Translational Lung Cancer Research, 4(4),327–338.

Duan P.et al.2015. BMI and risk of lung cancer; Systematic review and dose-response meta-analysis. Scientific Reports, 5,10375.

Eckhardt C. M.et al.2021. Enviromental exposures and lung aging: Molecular mechanism and implication for improving respiratory health. Current Environmental Health Reports, 8(2),150–161.

RStudio version 4.5.1 was used to create the summary table and 5 plots.