**Title:** Logistic and Ordinal Logistic Modeling of Computed Tomography Features Associated with Non-Tuberculous Mycobacteria Lung Disease

**Abstract:** Non-tuberculous mycobacteria lung disease (NTM-LD) is a chronic infection of the lungs caused by the inhalation of microbial organisms called non-tuberculous mycobacteria. NTM-LD is associated with radiologic features that can be observed through CT scans of the lungs, including atelectasis, bronchiectasis, consolidation, ground-glass opacities, tree-in-bud opacities, centrilobular nodules, and cavities. There is evidence in existing medical literature that NTM-LD is more severe and its associated features, especially bronchiectasis, are observed more frequently in certain regions of the lung, namely the right middle lobe and lingula. This analysis seeks to quantify the severity of these radiologic features among 166 subjects’ CT scans and compare this severity across six regions of the lung, namely the right upper lobe (RUL), right middle lobe (RML), right lower lobe (RLL), the left upper lobe assessed in two distinct areas: the left upper segment (LUS) and left lingular segment (LLS), and the left lower lobe (LLL). Nodule and cavity severity was scored on a two-point scale (“0” for absence of the feature and “1” for presence), and the remaining five features’ severity was scored on a four-point scale (“0” for absence of the feature, “1” for 0-25% of the lobe involved with the feature, “2” for 25-50% of the lobe involved with the feature, and “3” for >50% of the lobe involved with the feature). Features with binary scores were analyzed with logistic regression mixed models, while features with ordinal scores were analyzed with ordinal logistic regression mixed models, each incorporating random intercepts for subject and a nested random effect for rater to account for repeated measures over lobes within subjects. The results of the analysis indicate that atelectasis and bronchiectasis were most severe in the RML and LLS; consolidation in the RML and RUL; ground-glass opacities and nodules in the RLL, RUL, and LLL; thick wall cavities in the RUL and RLL; tree-in-bud opacities in the RLL and LLL; while thin wall cavities had no significant differences in lobar severity. These results confirm preferential involvement of lung regions with NTM-LD which can focus surveillance on the most affected regions and inform treatment recommendations.