A Multi-omic Analysis of Lung Adenocarcinoma: An Examination of Differential Smoking Status and Sex-related Survival Outcomes to Inform Clinical Decision-making

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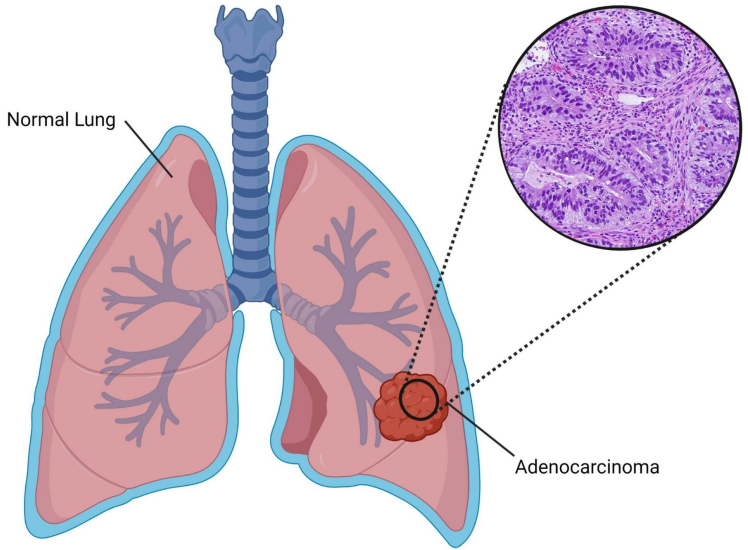
QBIO 490 Fa22 Final Project

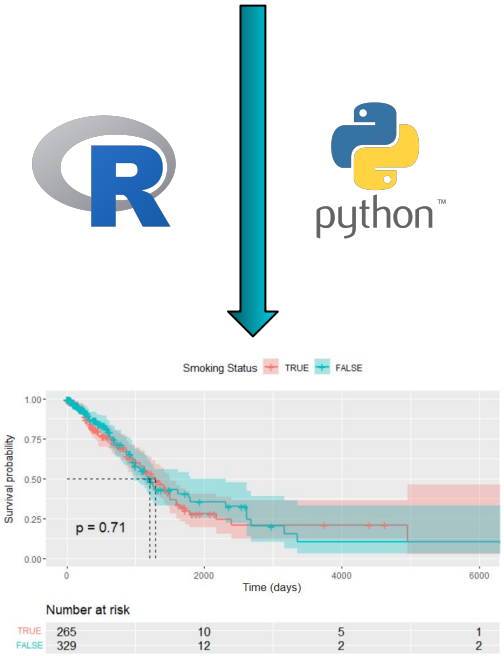
Introduction

- Clinical presentation & significance
- Current clinical paradigm for treatment
- Risk factors
  - Smoking
- Current state of research



Methods

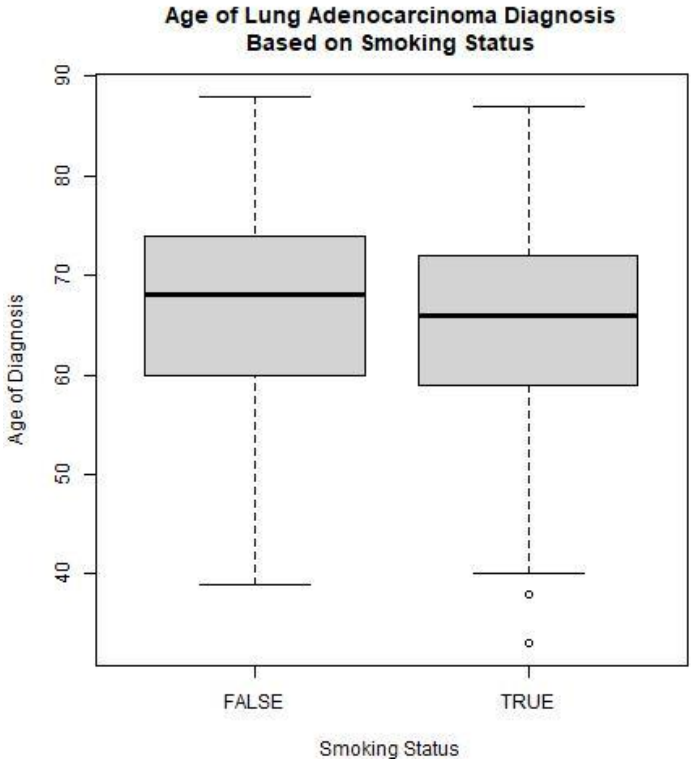
- Data sources
  - The Cancer Genome Atlas (TCGA)
    - LUAD – 617 LA patients
  - Clinical Proteomic Tumor Analysis Consortium (CPTAC) – 211 LA patients
- R
  - Boxplots, histograms, Kaplan–Meier survival plots, oncoplots/co-oncoplots, lollipop plots, and Draftsman plot
- Python
  - Heatmaps

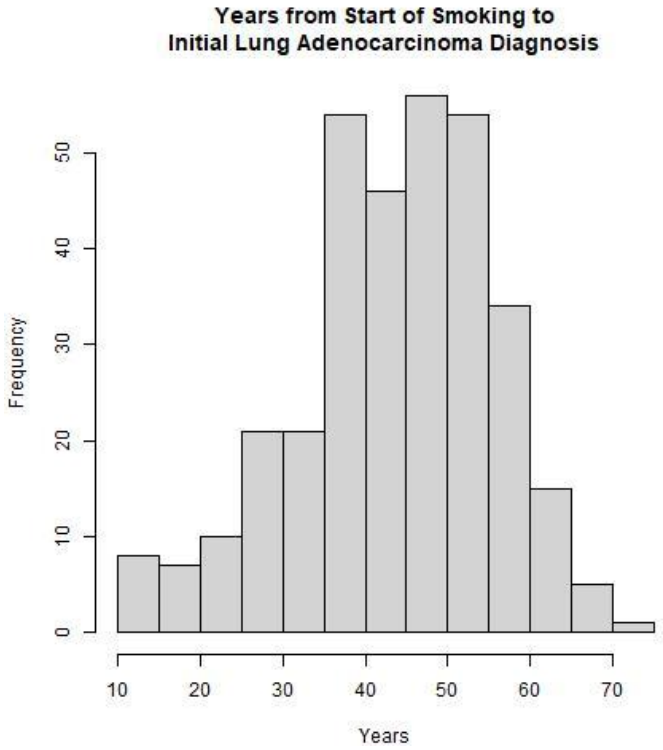


Purpose:

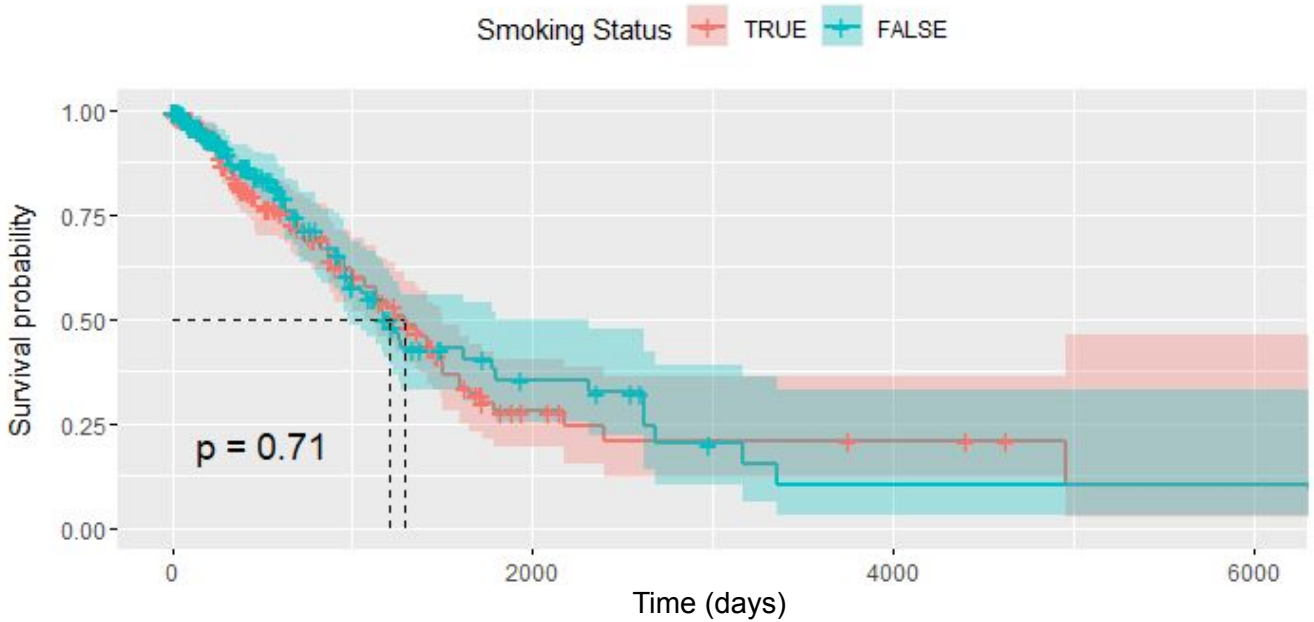
a. Corroborate existing knowledge about LA
b. Novel insights on mortality via multi-omic data
c. Arrive at clinically relevant conclusions

Low Resolution in Clinical and Demographic Data

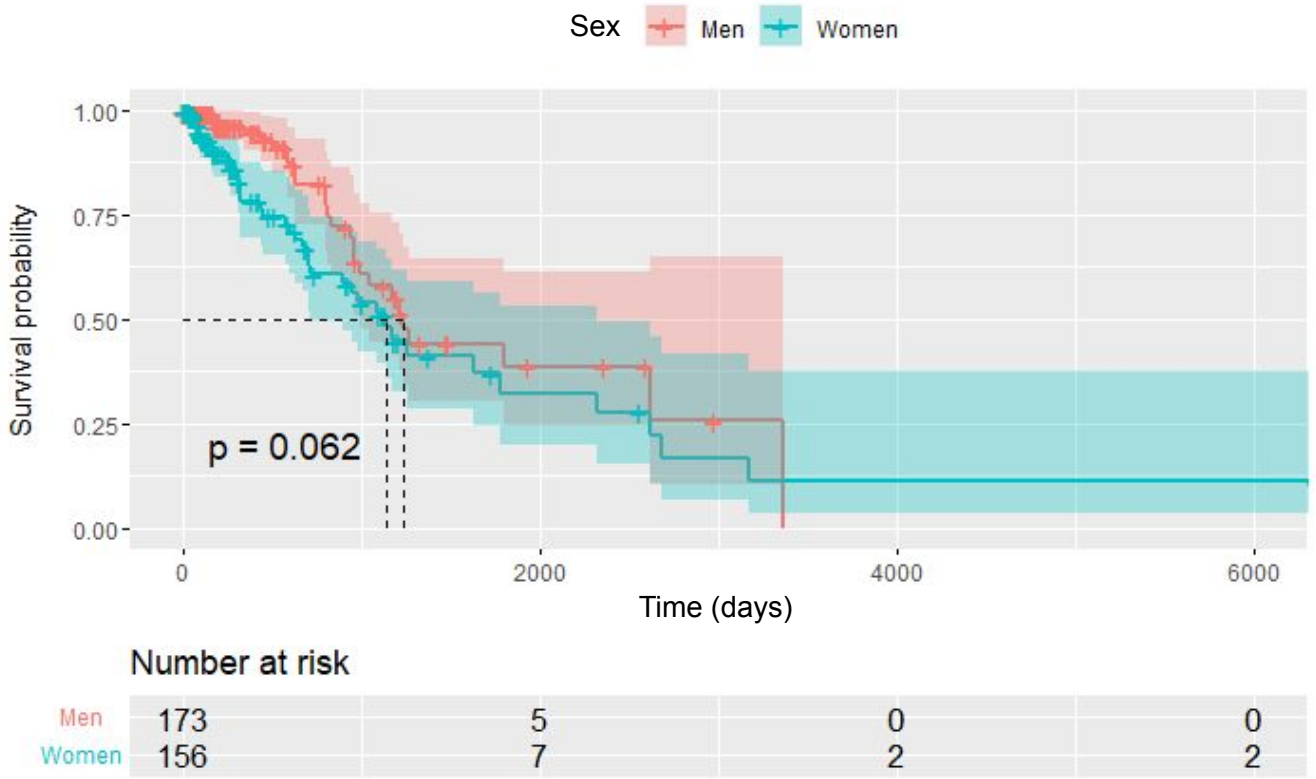




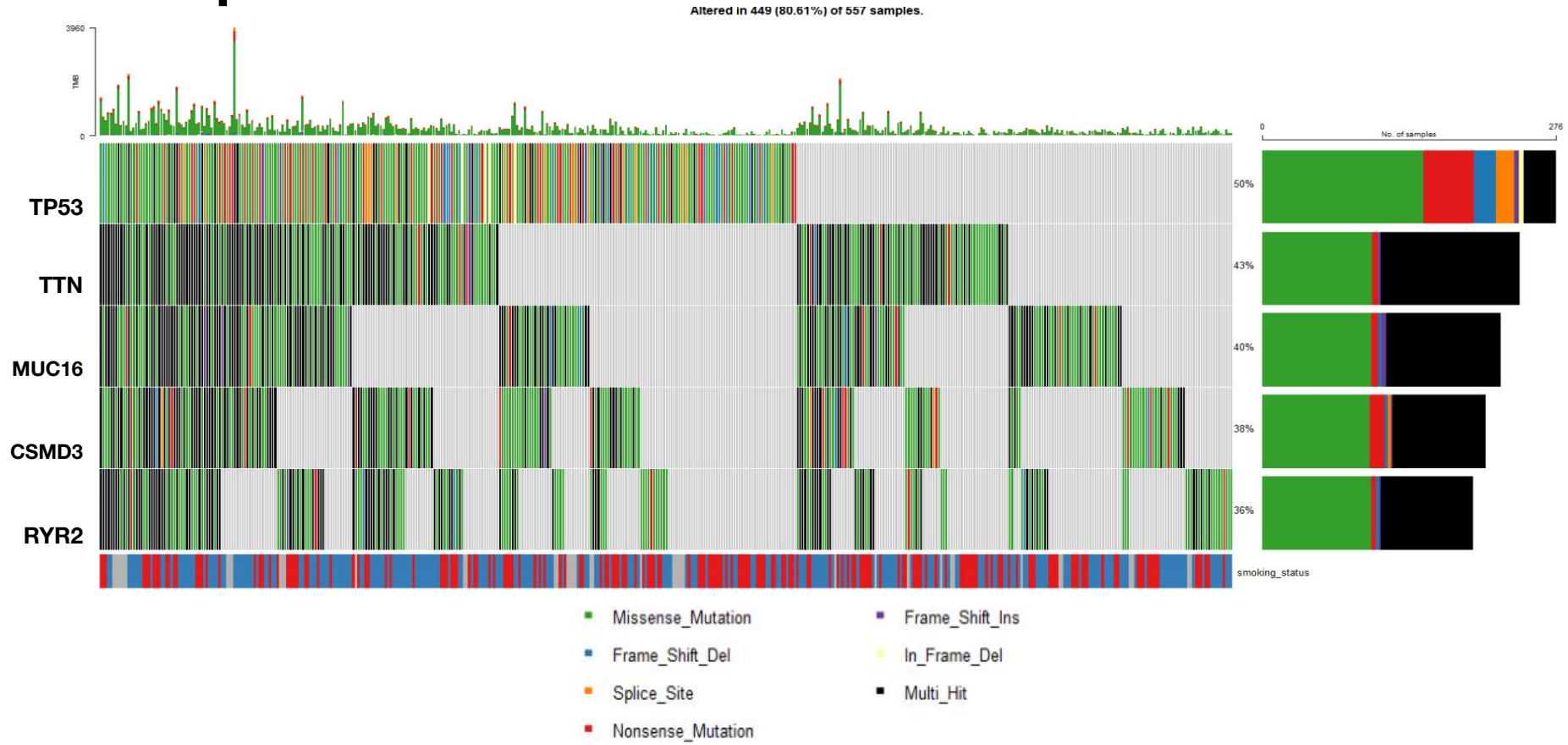
Survival Outcomes in Smoking and Non-smoking LA Subpopulations are Statistically Insignificant



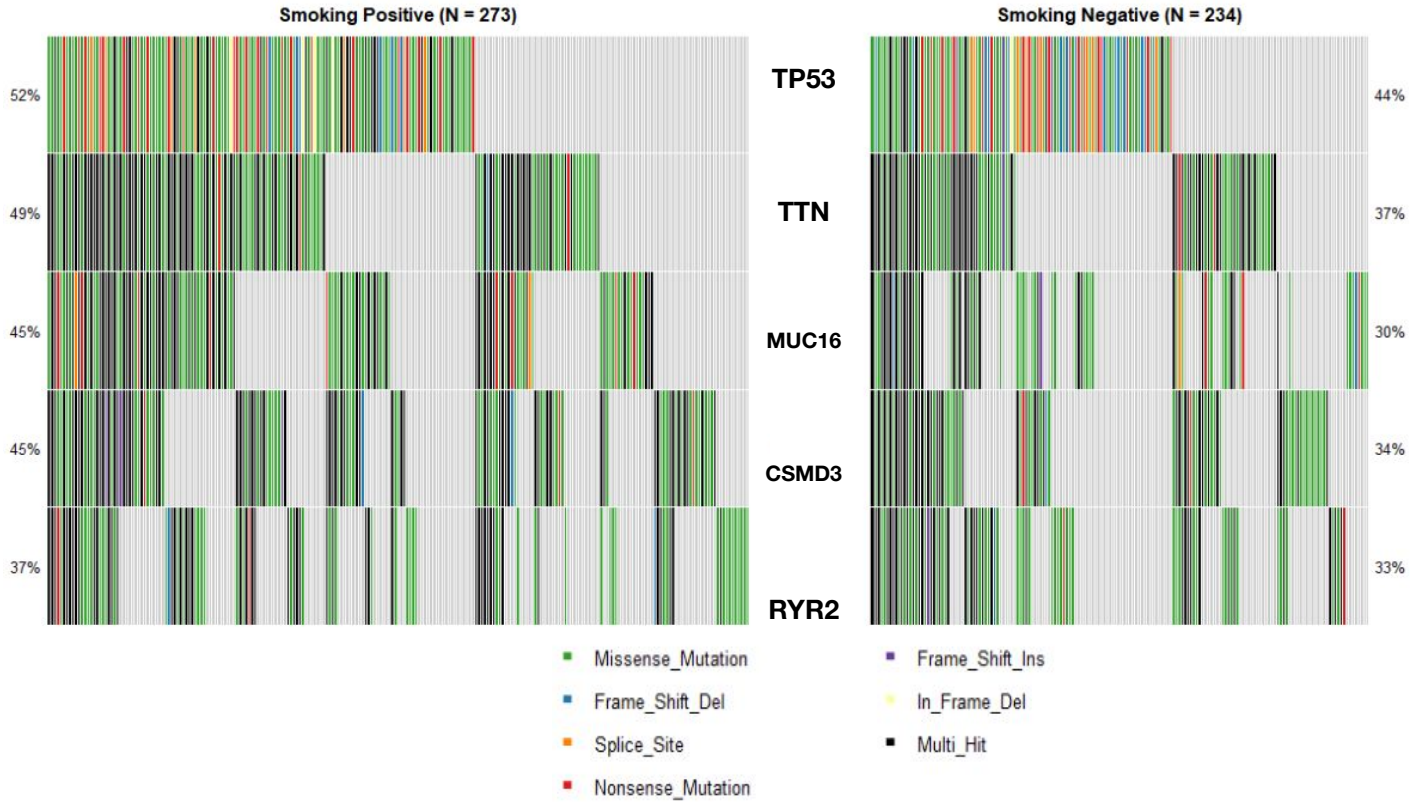
KM Survival Plot Indicating Near-Statistically Significant Difference in Survival of LA Patients based on Sex



Oncoplot of Five Most Mutated Genes in LA Patients

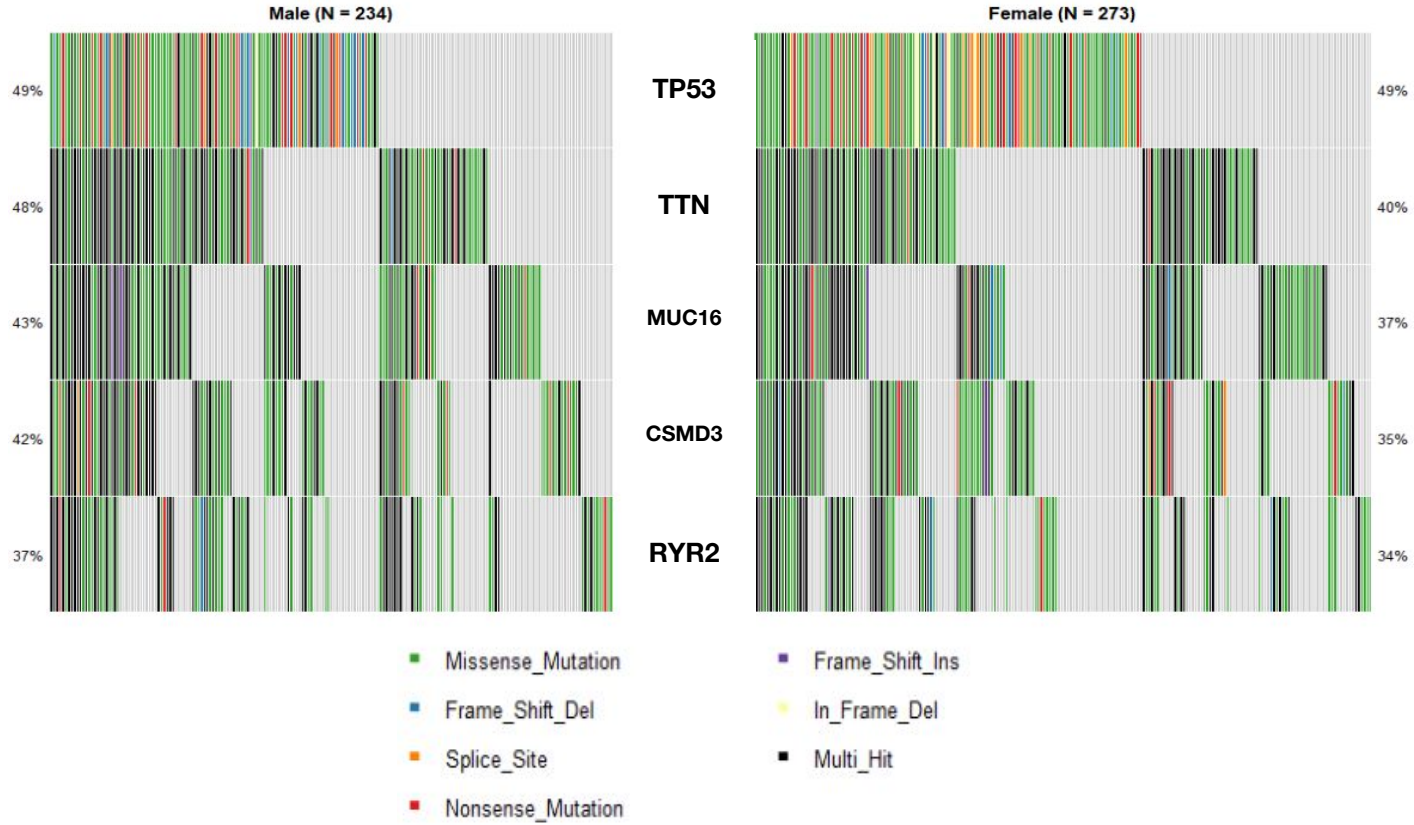


Mutations in Commonly-Mutated Genes for LA Patients Differ by Smoking Status



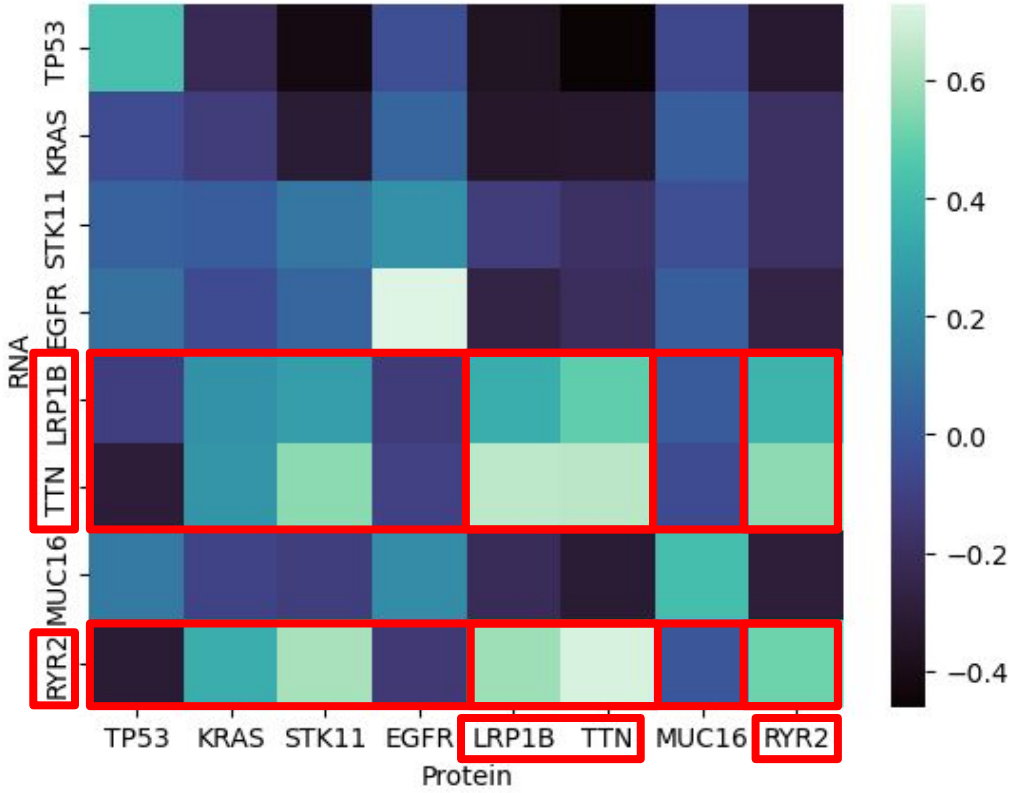
Increased Mutations at Beginning of TTN Gene for Smoking LA Patients

Co-Oncoplot Stratified by Sex

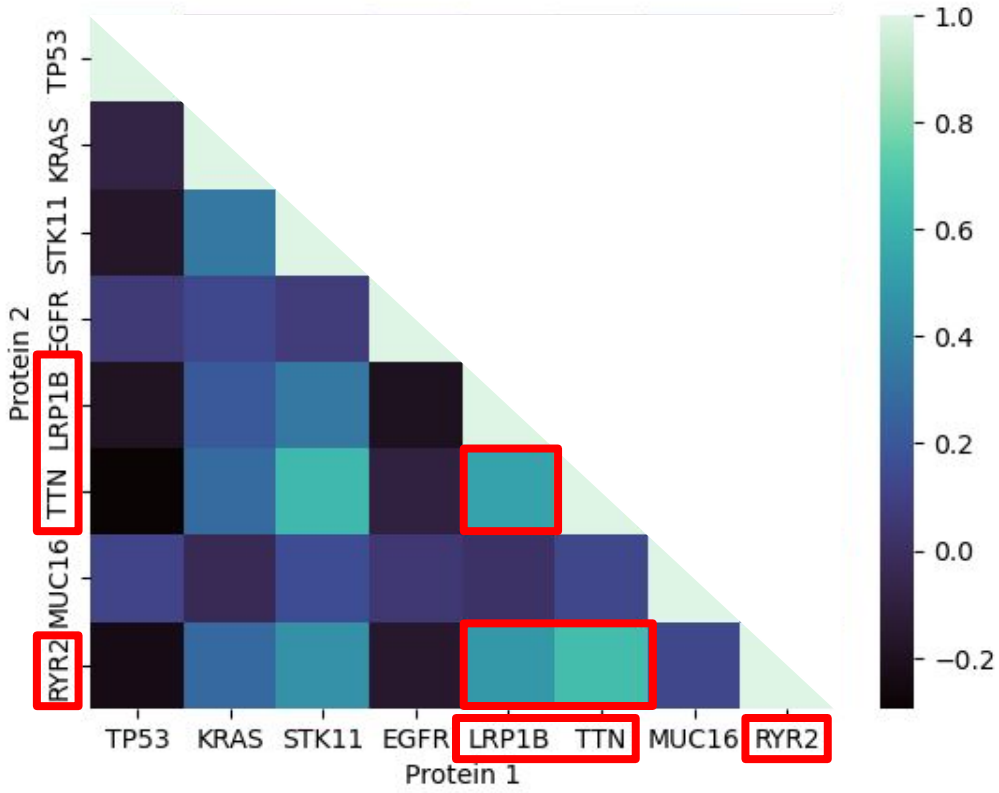


Scattered Mutation Rate Differences Across Sex for Gene CSMD3

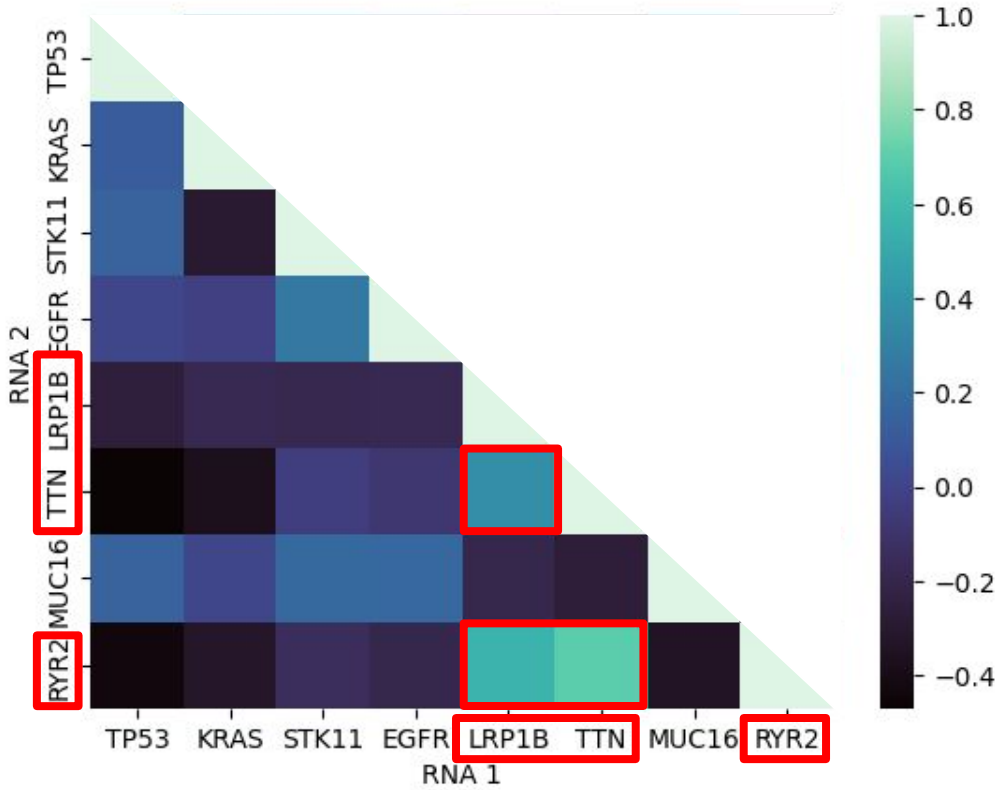
Strong Positive Correlations in Protein-RNA Pair Expression for Genes *LRP1B, TTN, and RYR2*



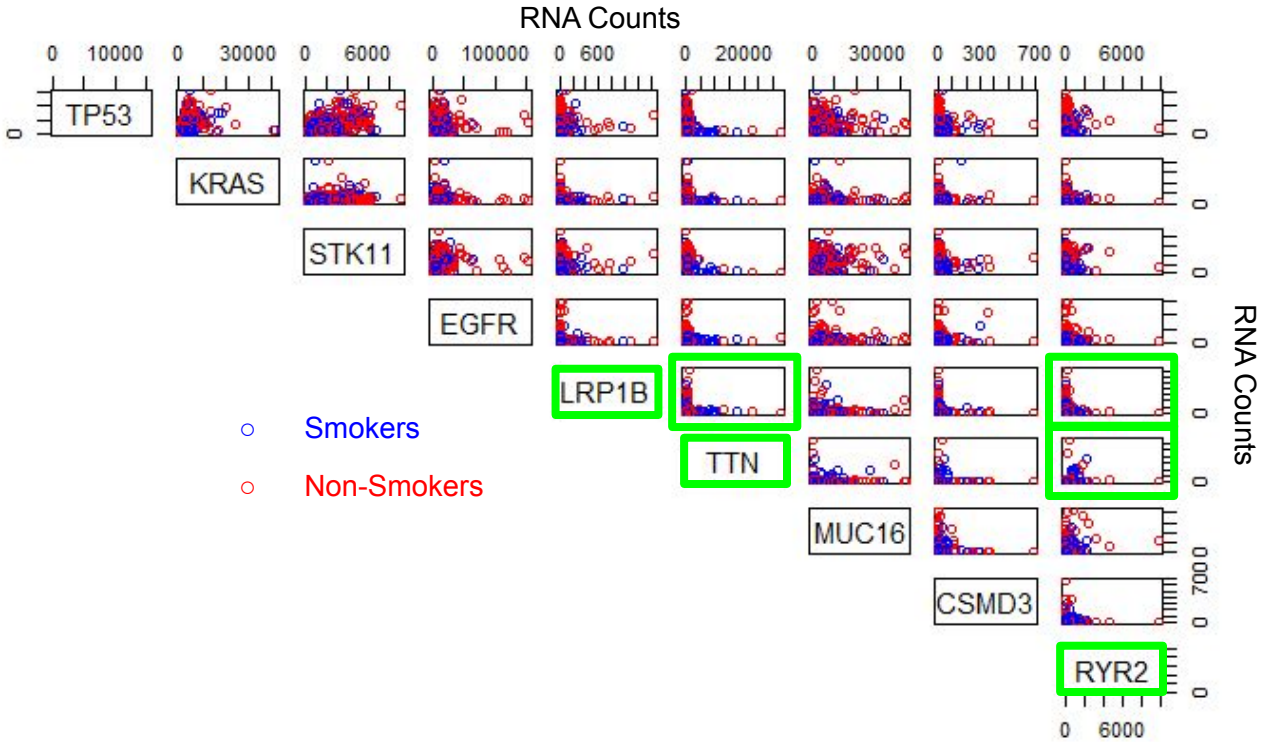
Moderate Positive Correlations in Protein-Protein Pair Expression for Genes *LRP1B, TTN, and RYR2*



Moderate Positive Correlations in RNA-RNA Pair Expression for Genes *LRP1B, TTN, and RYR2*



Positive Correlations in RNA-RNA Pair Expression for Genes *LRP1B, TTN, and RYR2* are Corroborated by RNA Data



Key Takeaways

1. Biological mechanisms underlying LA incidence in smokers and nonsmokers appear to be different (ie the differential gene expression) but the actual survival differences between the two groups are largely analogous
2. Three genes of interest (*TTN*, *RYR2*, and *LRP1B*) are strongly and positively correlated in RNA/protein, RNA/RNA, and protein/protein expression, and can be targeted by certain individualized therapies

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Questions?