An Investigation into Glioblastoma Multiforme Survival

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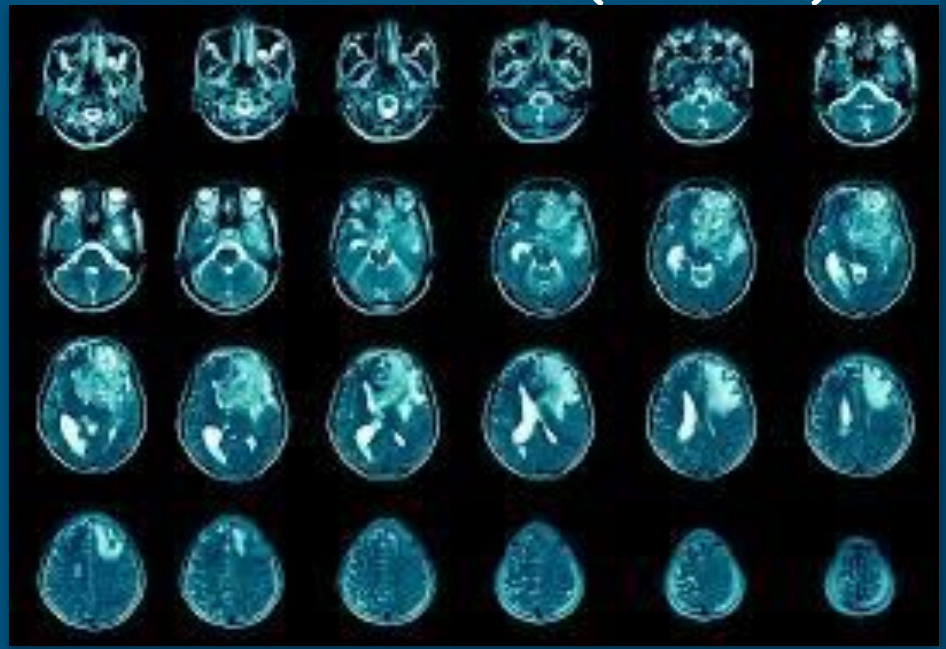
Glioblastoma Multiforme (GBM)



https://www.mdanderson.org/cancerwise/understanding-glioblastoma.h00-158828856.html

The uncontrolled division of cells in the central nervous system

Kills 13,000 Americans annually

Risk factors:

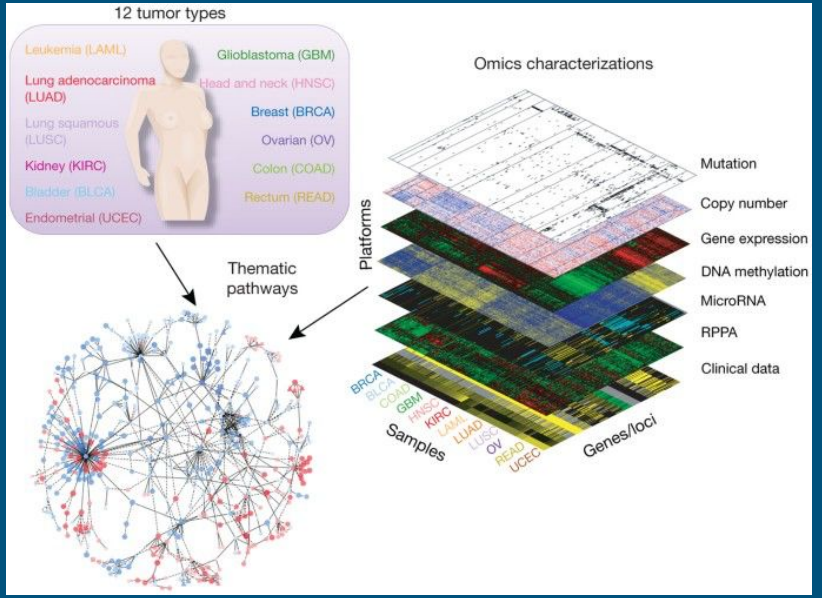
- Genetic
  - PTEN, EGFR, CDKN2A, CDH1
- Environmental
  - Radiation exposure

The Data

What is TCGA and how will we be using it?

What is CPTAC?

Analysing problems from a multi-omic perspective.

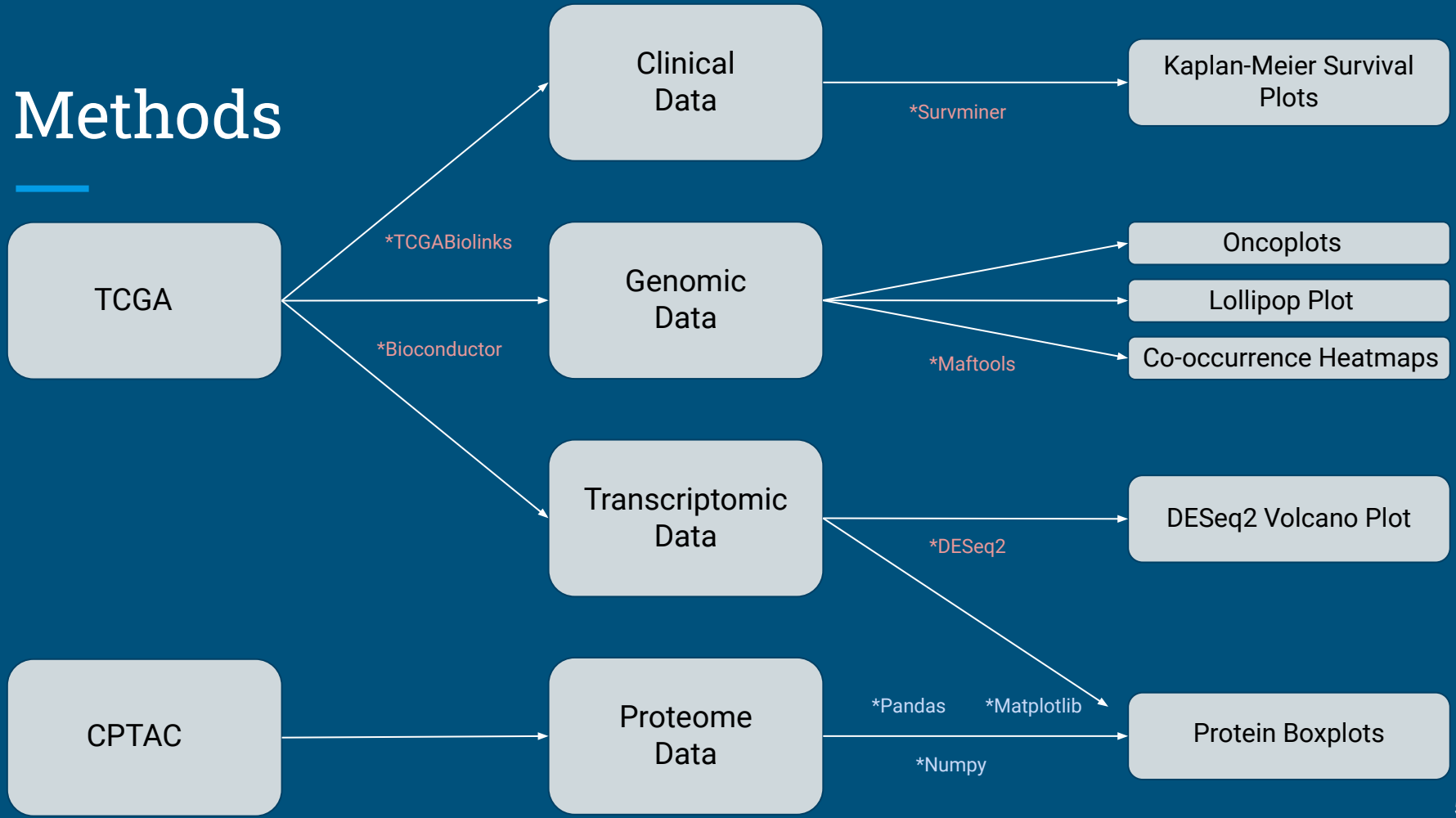


https://www.nature.com/articles/ng.2764

The Investigation

Hypothesis: There will be significant differences in genomic, transcriptomic, proteomic, and clinical profiles between surviving patients and non-surviving patients.

Methods

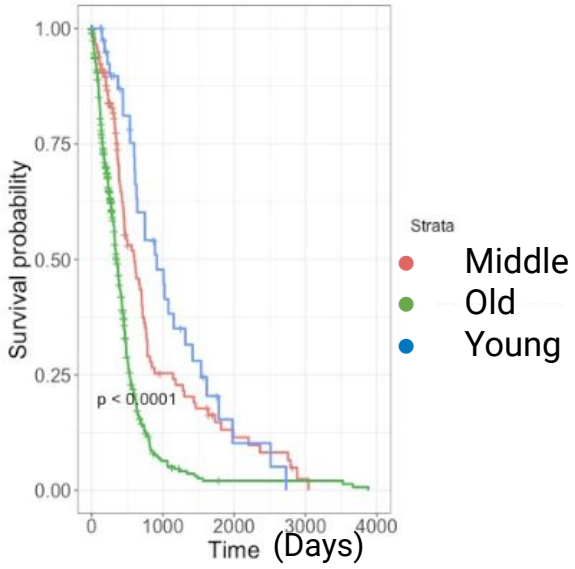

TCGA
CPTAC
*TCGABiolinks
*Bioconductor
Clinical Data
Genomic Data
Transcriptomic Data
Proteome Data
*Survminer
*Maftools
*DESeq2
*Pandas
*Matplotlib
*Numpy
Kaplan-Meier Survival Plots
Oncoplots
Lollipop Plot
Co-occurrence Heatmaps
DESeq2 Volcano Plot
Protein Boxplots

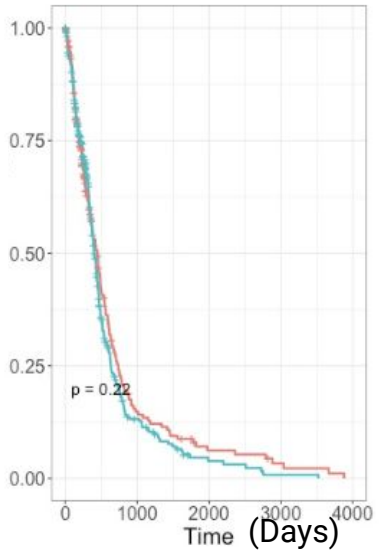
Dataset Breakdown

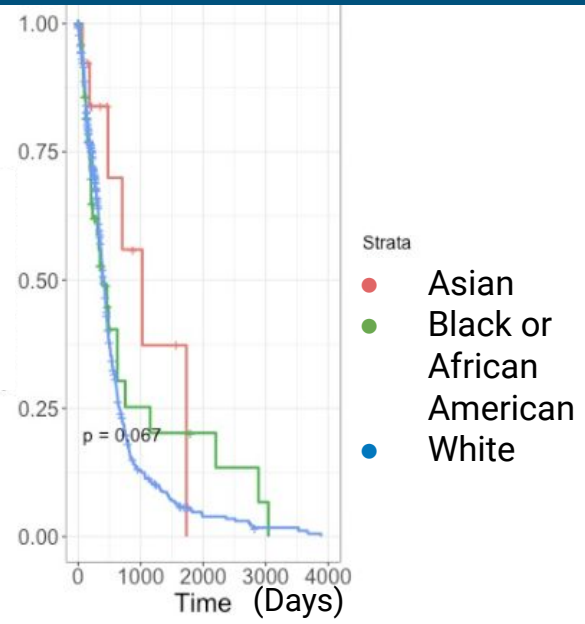
Age	Sex	Race
Old patients = 556	Male patients = 368	White patients = 509
Middle-aged patients = 119	Female patients = 231	Black patients = 52
Young patients = 44		Asian patients = 13

Kaplan-Meier plots show age and, possibly, race impact a patient's survival rate

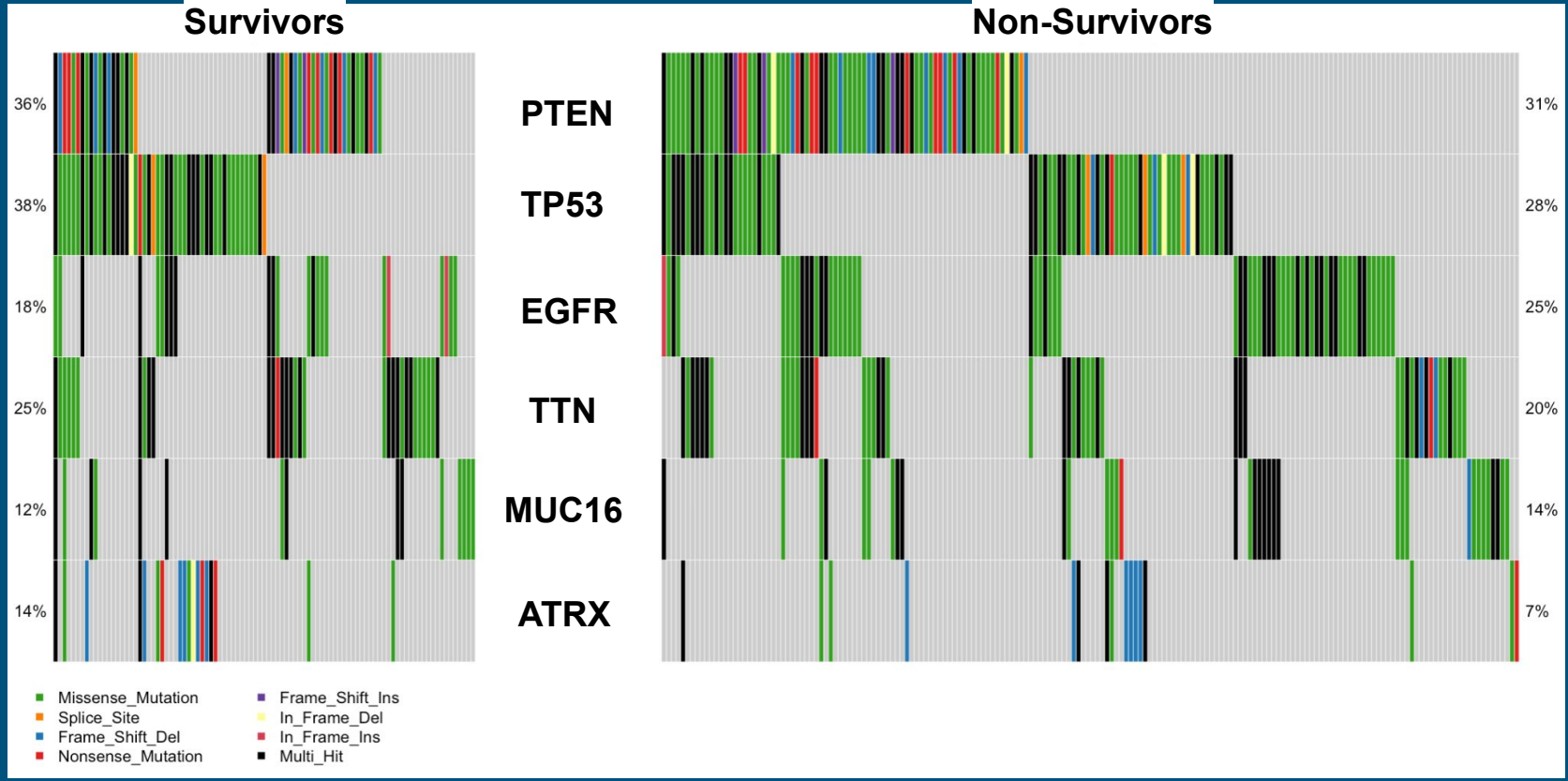
Figure 1. 1a: Age 1b: Sex 1c: Race







Oncoplots Between Survivors and Non-survivors



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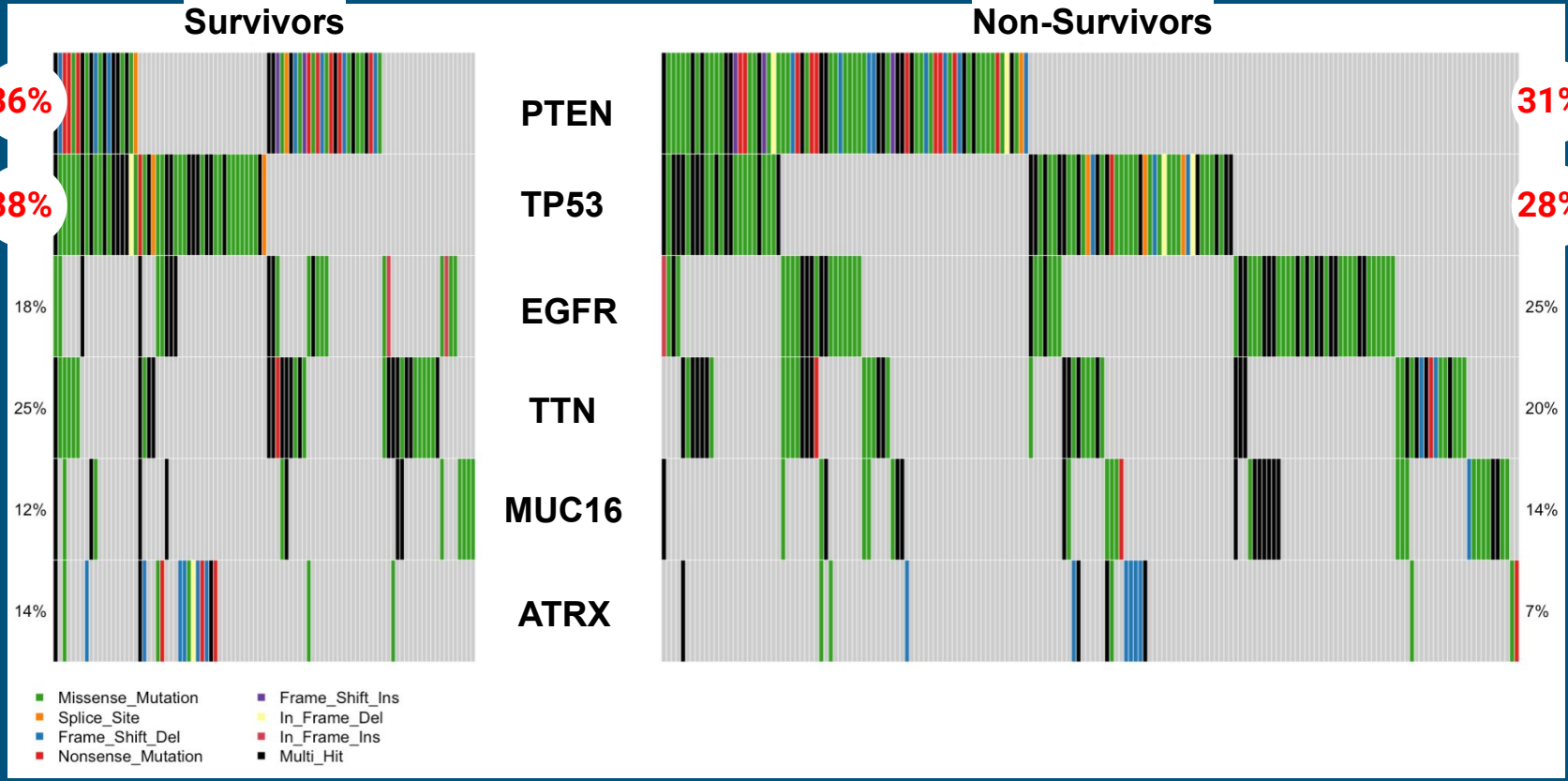
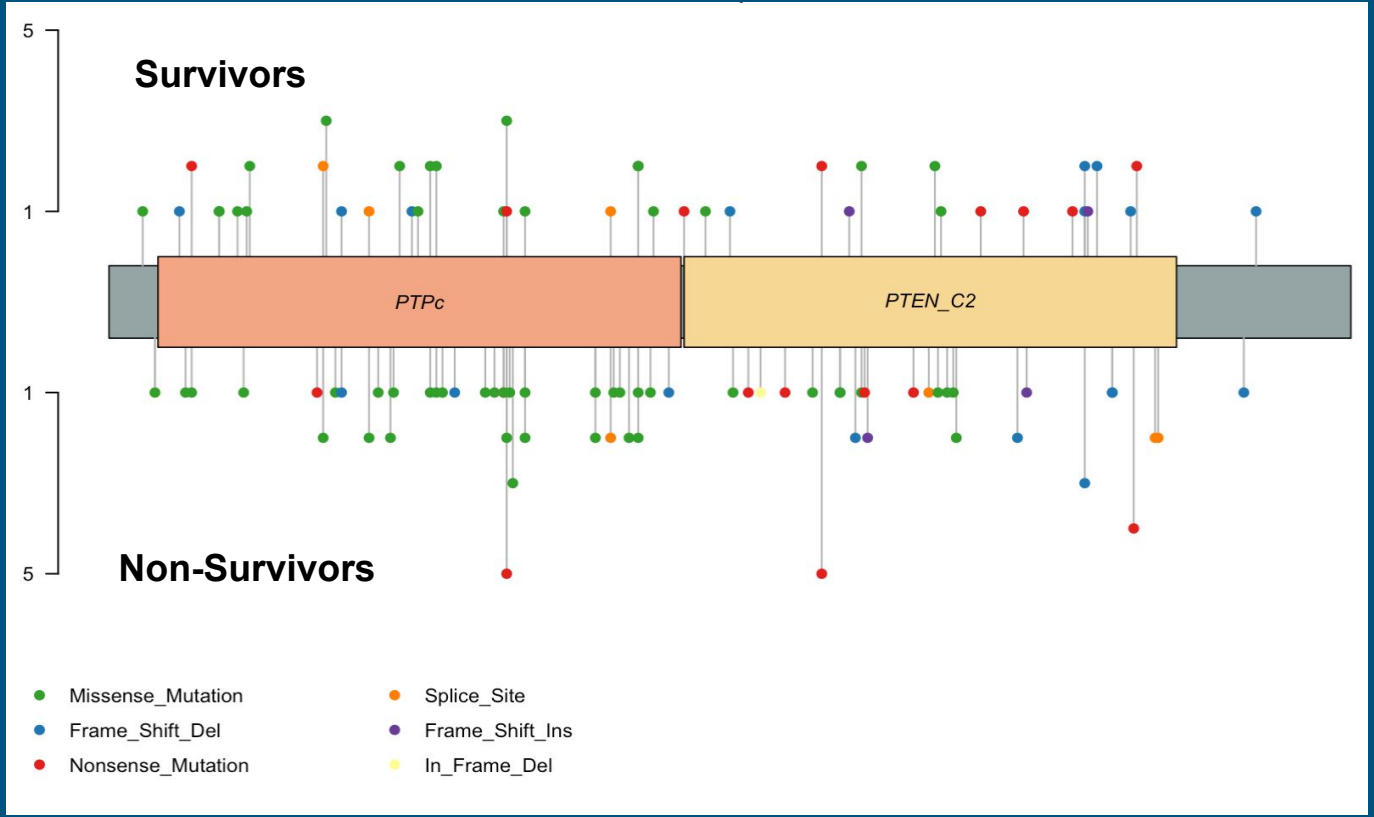
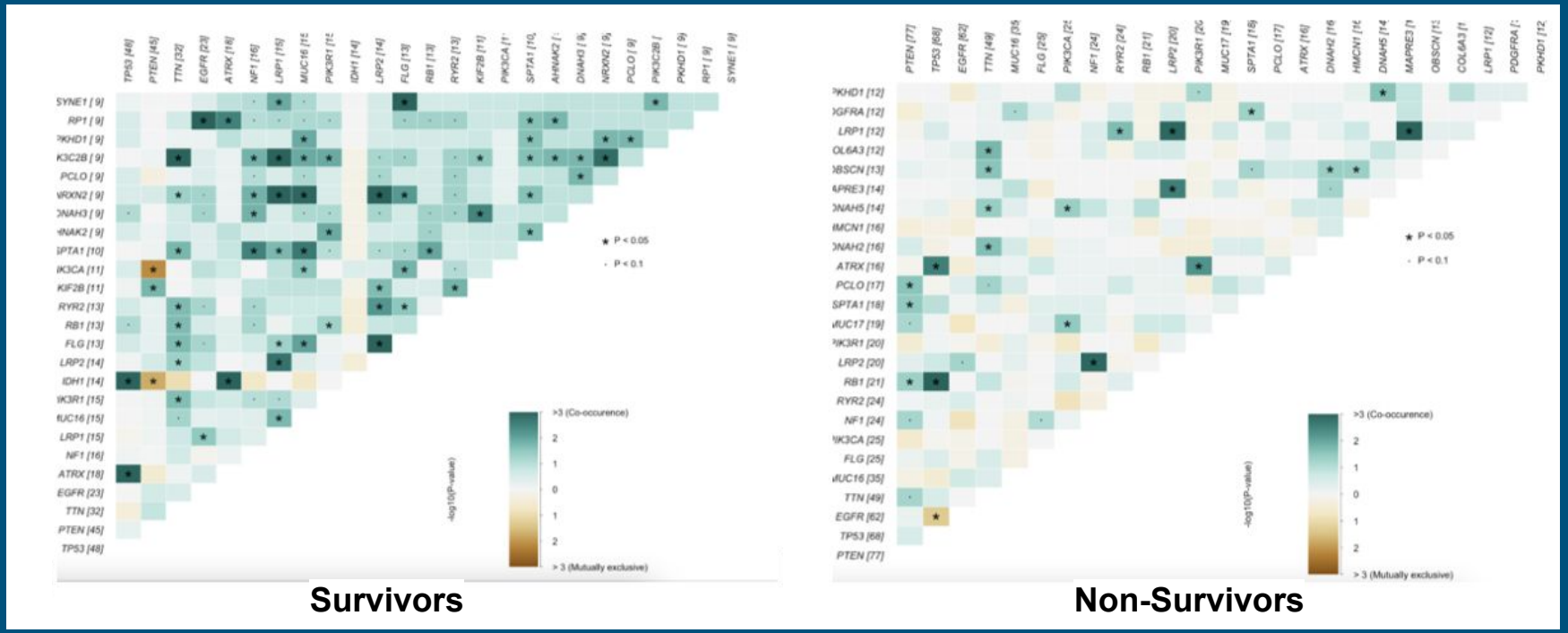


Gene Mutations: PTEN



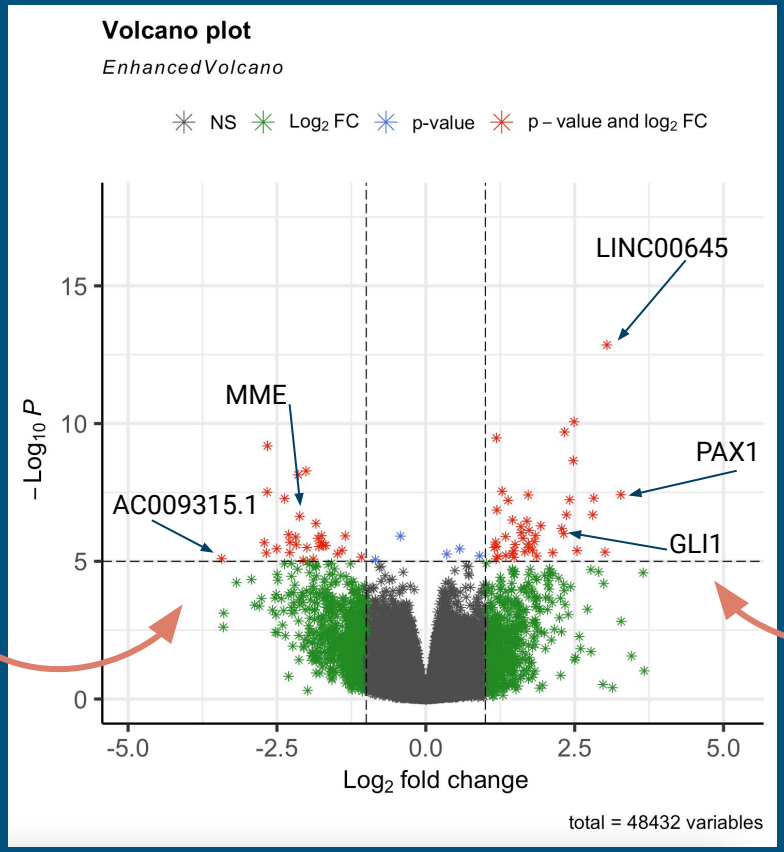
Mutation Co-occurrence



Survivors **Non-Survivors**

Volcano plot between survivors and non-survivors shows several upregulated genes in each group

- upregulation in non-survivors



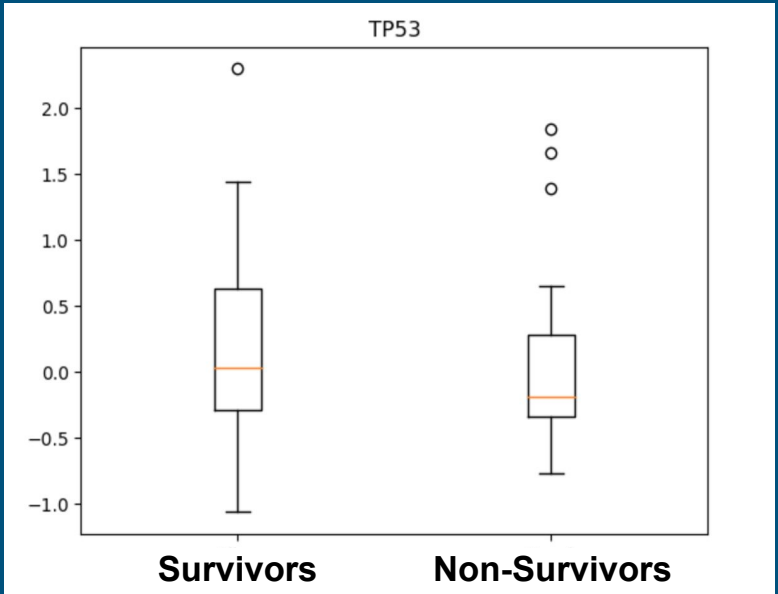
- upregulation in survivors

- Mostly non-coding RNAs
- Differences from oncoplots

Figure 5.

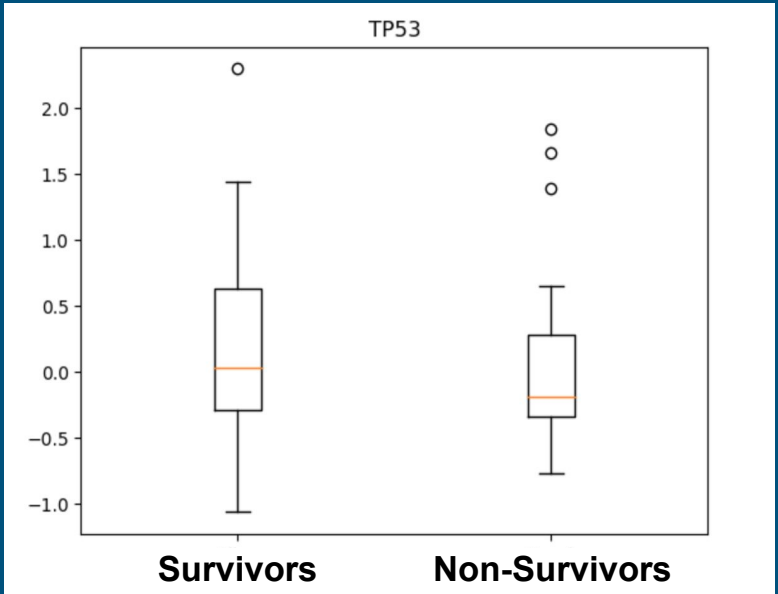
Protein Expression

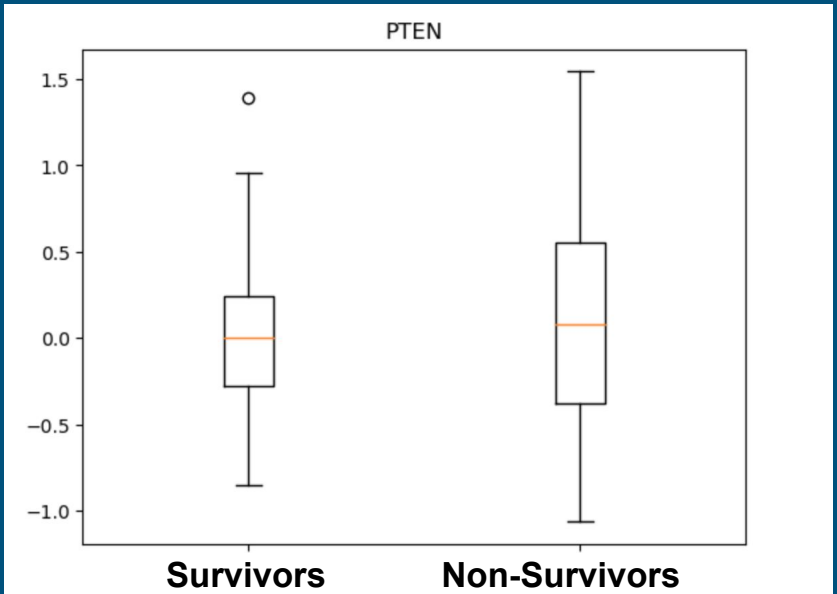
For commonly mutated genes



Protein Expression

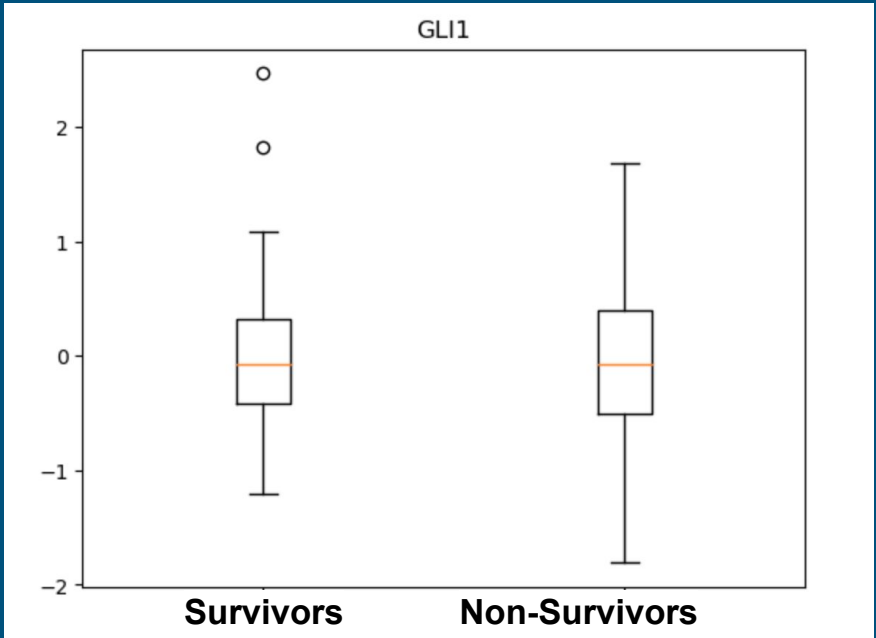
For commonly mutated genes





Protein Expression

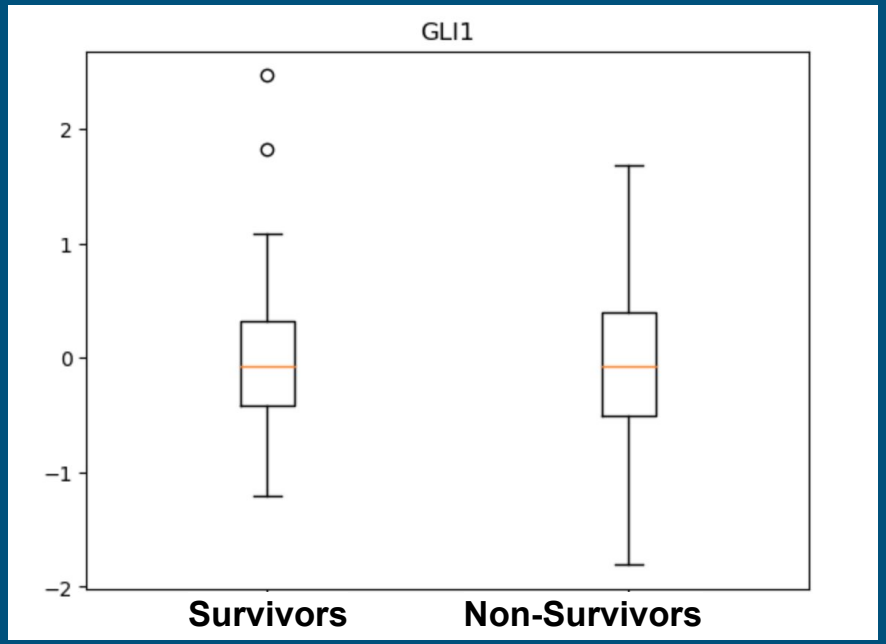
For differentially expressed RNA

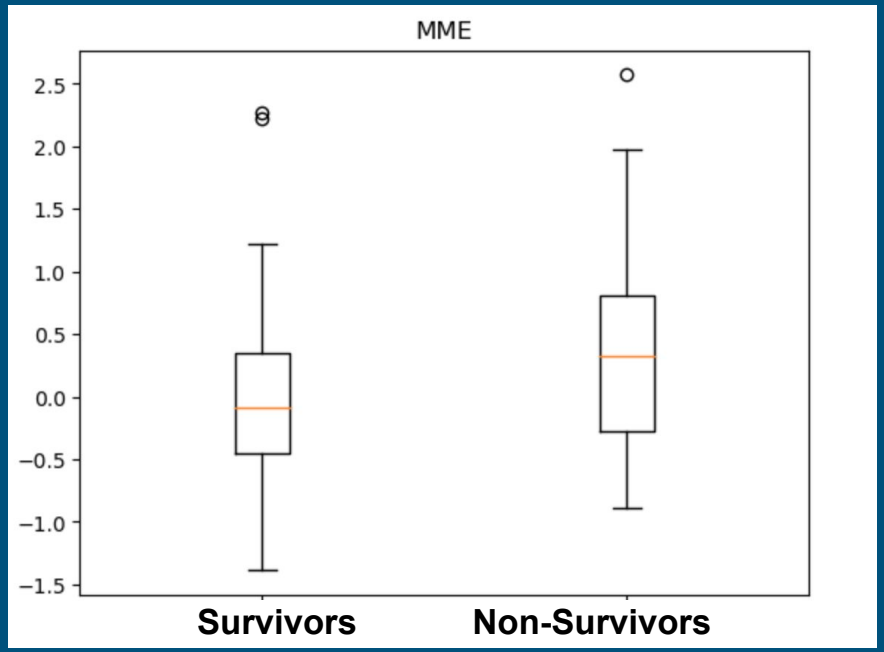


Survivor - upregulated

Protein Expression

For differentially expressed RNA





Survivor - upregulated

Non-Survivor - upregulated

Key Takeaways

- Differences between age and race
- Transcriptomic Differences -> non-coding RNAs
  - PAX1 and AC009315.1 importance
- Differences in mutations
  - PTEN PTPc domain
- Limited continuity between mutations, RNA, protein
  - Exception: MME

Moving Forwards

Non-coding upregulated gene

-(LINC00645)

Demographics and survivals

-African-American/Black and Asian patients

Larger sample size

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Thank You For Listening

Questions?