Clinical and Multi-Omic Prognostic Factors of Glioblastomas

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QBIO 490: Multi-Omic Data Analysis
Fall 2022

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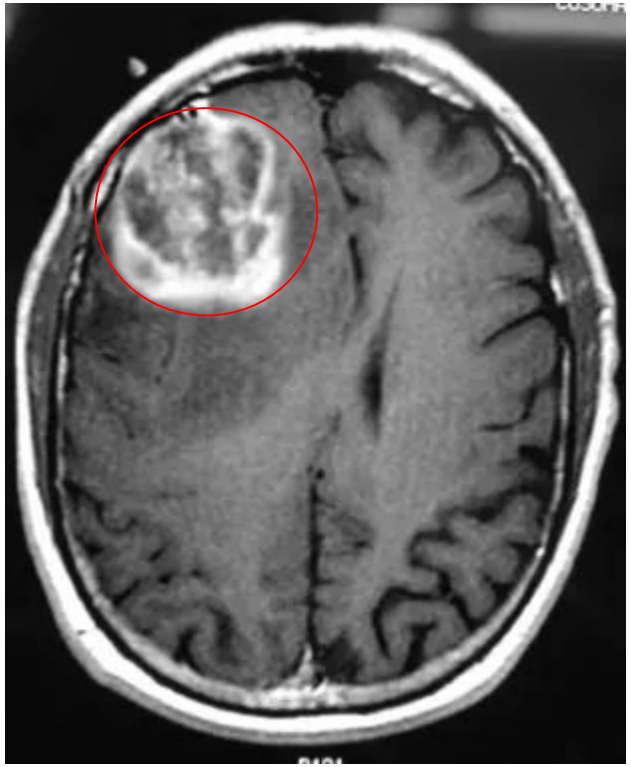

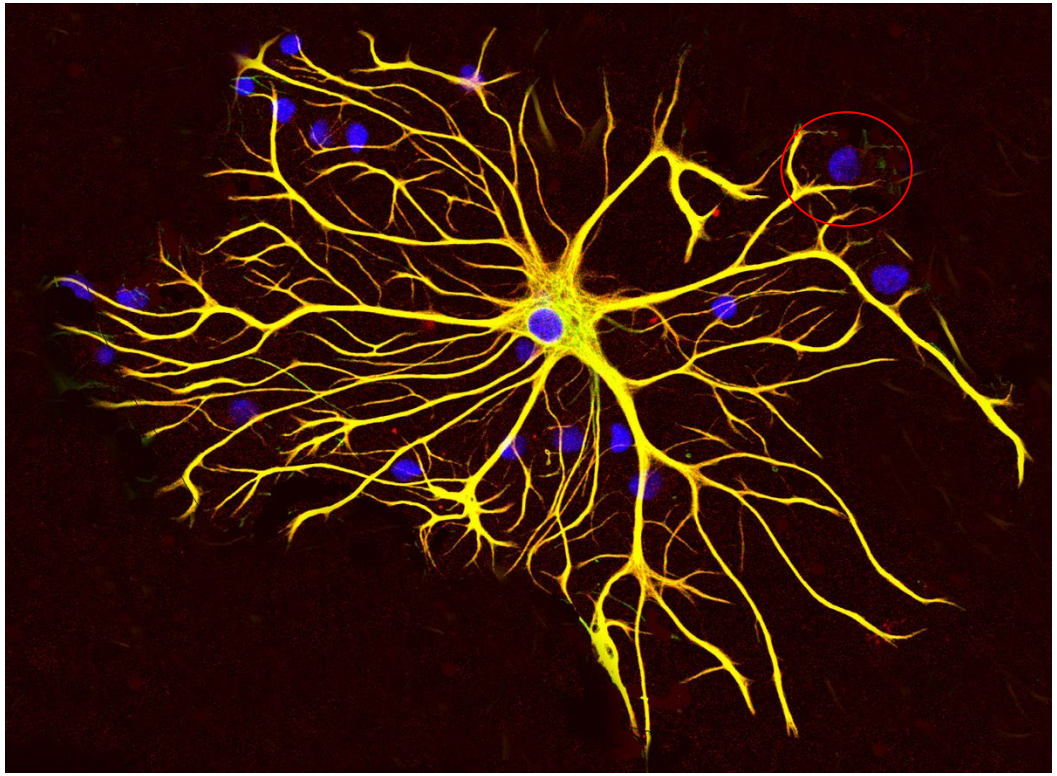

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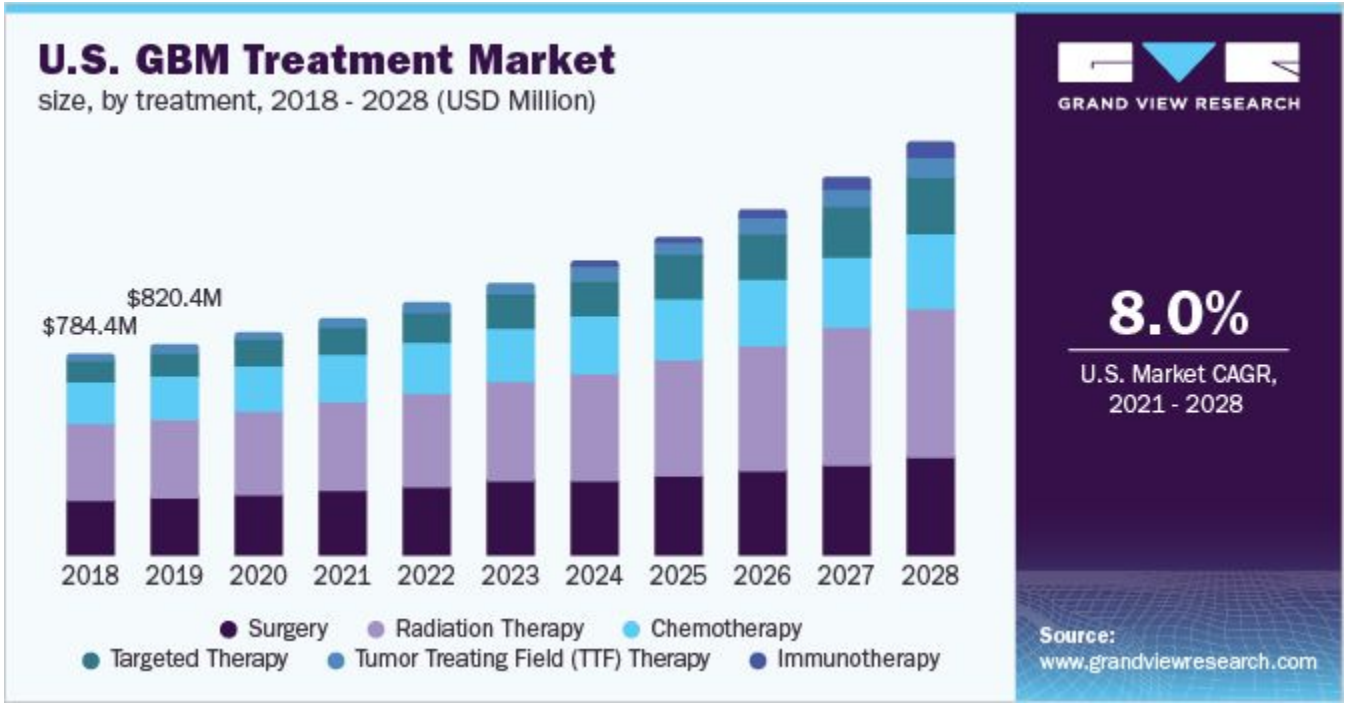
Comparing 5-year survival rate of GBM to other cancers worldwide

GBM = Glioblastoma
Source: Roche



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Methods

Statistical analyses → RStudio IDE (R), Jupyter Notebook (Python)

Datasets → TCGA (Accession: TCGA-GBM) , CPTAC (Accession: Gbm)

590 TCGA & 115 CPTAC patients post-processing

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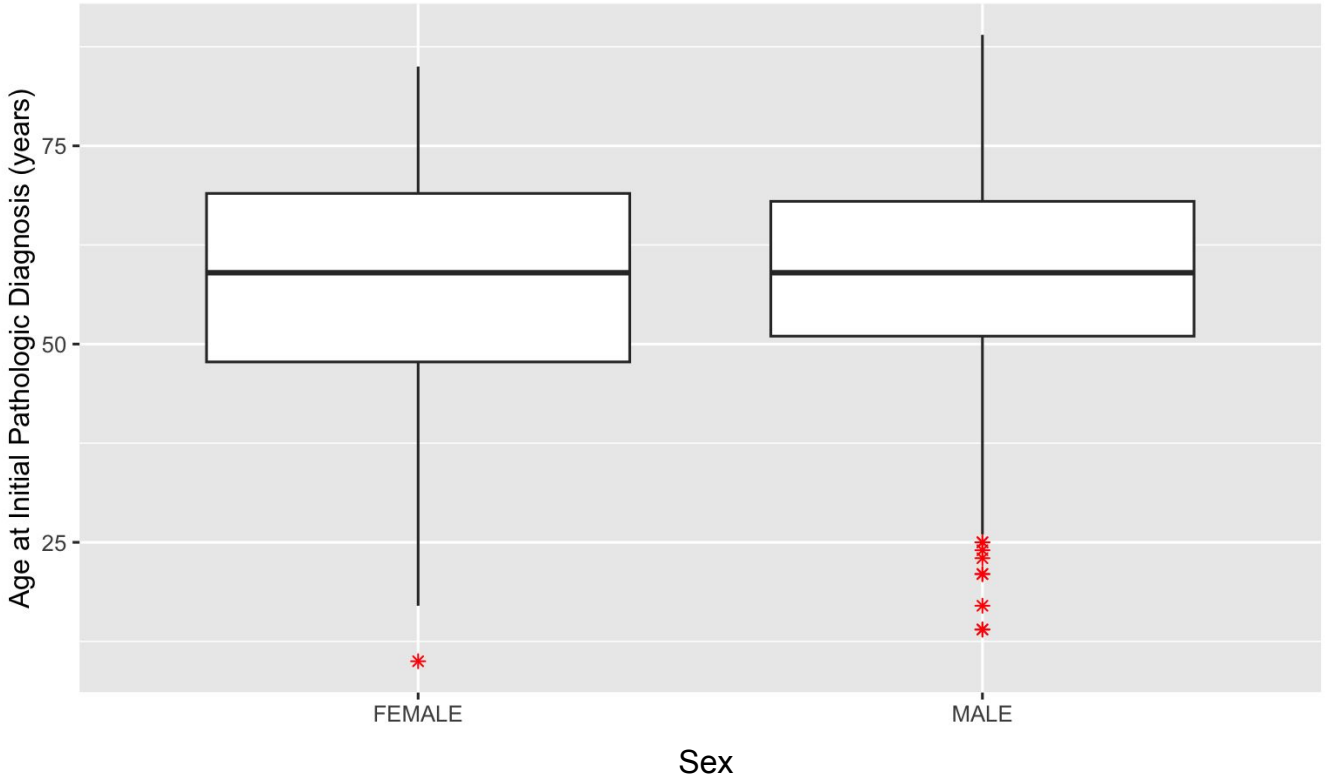
No Significant Variation in Age at Diagnosis Based Upon Patient Sex



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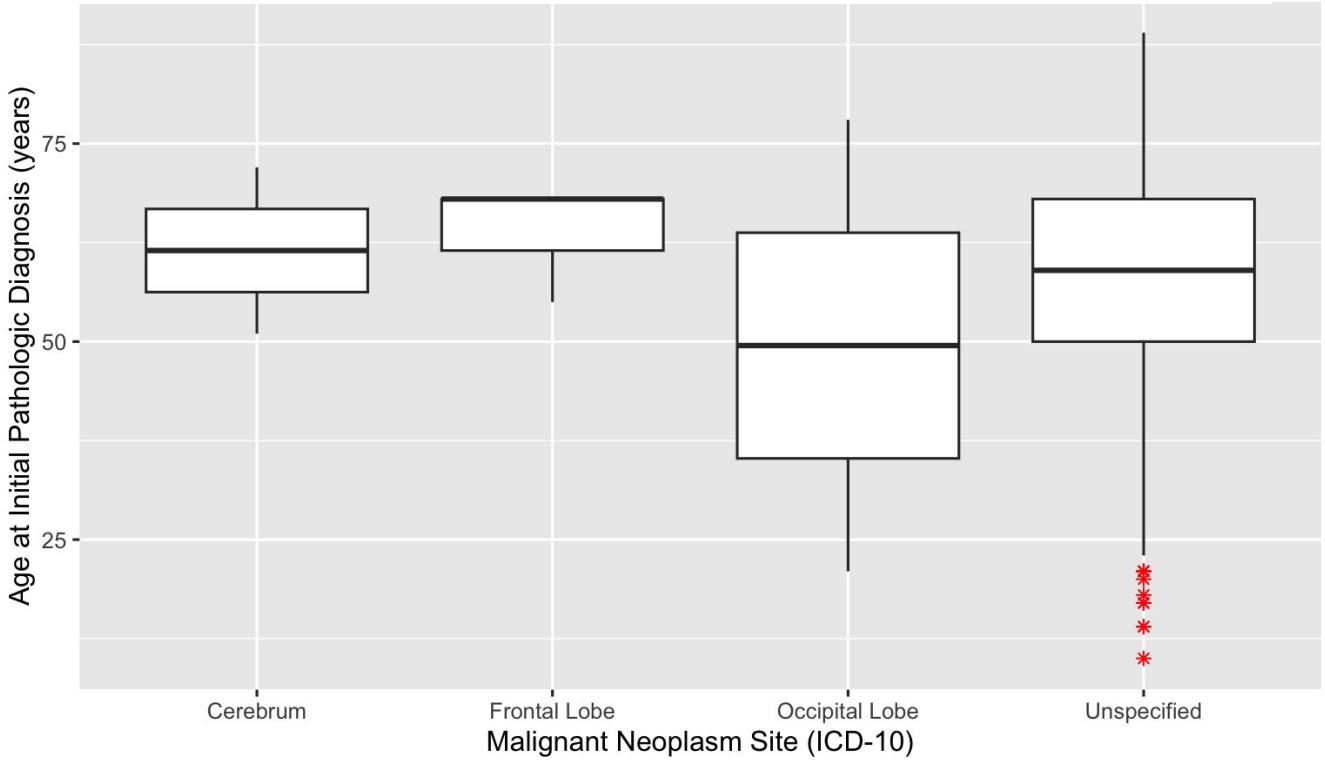
No Significant Variation in Age at Diagnosis Based Upon GBM Site



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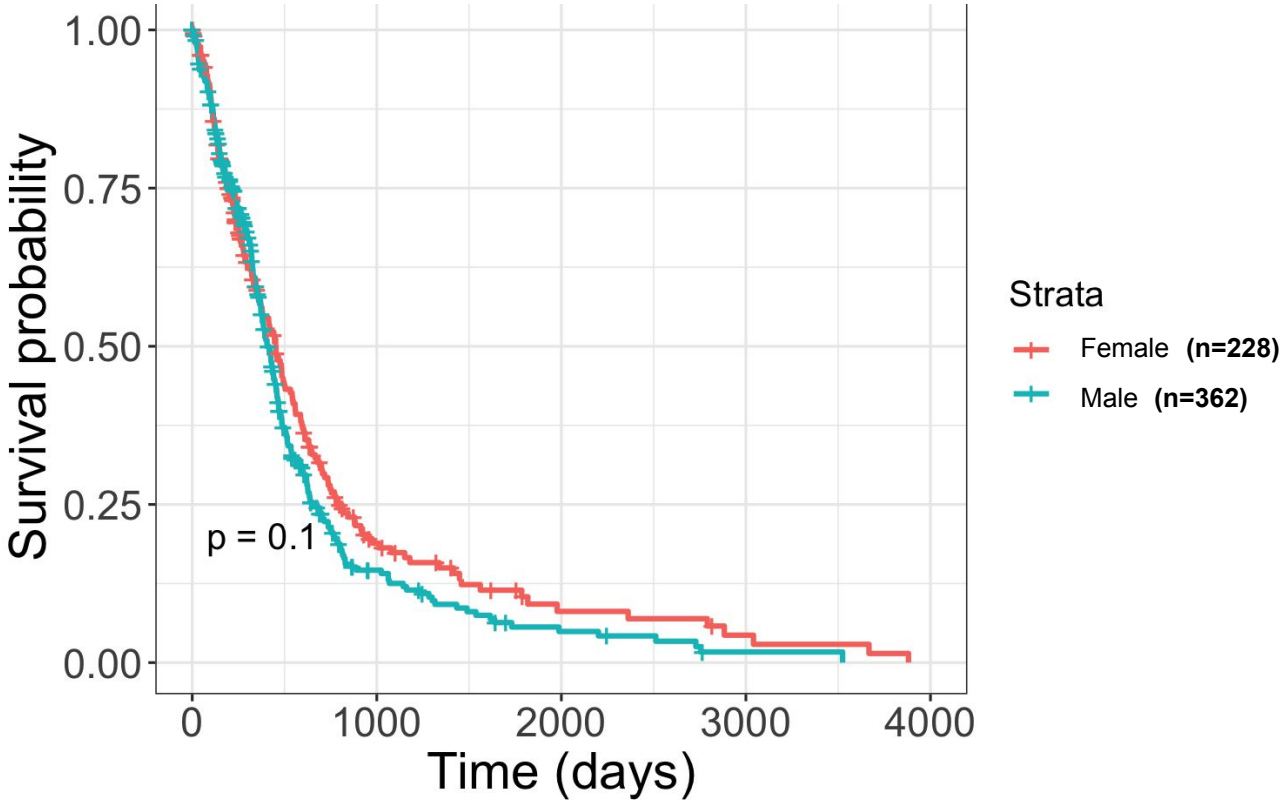
Patient Sex Is Not a Significant Discriminating Factor for GBM Prognosis



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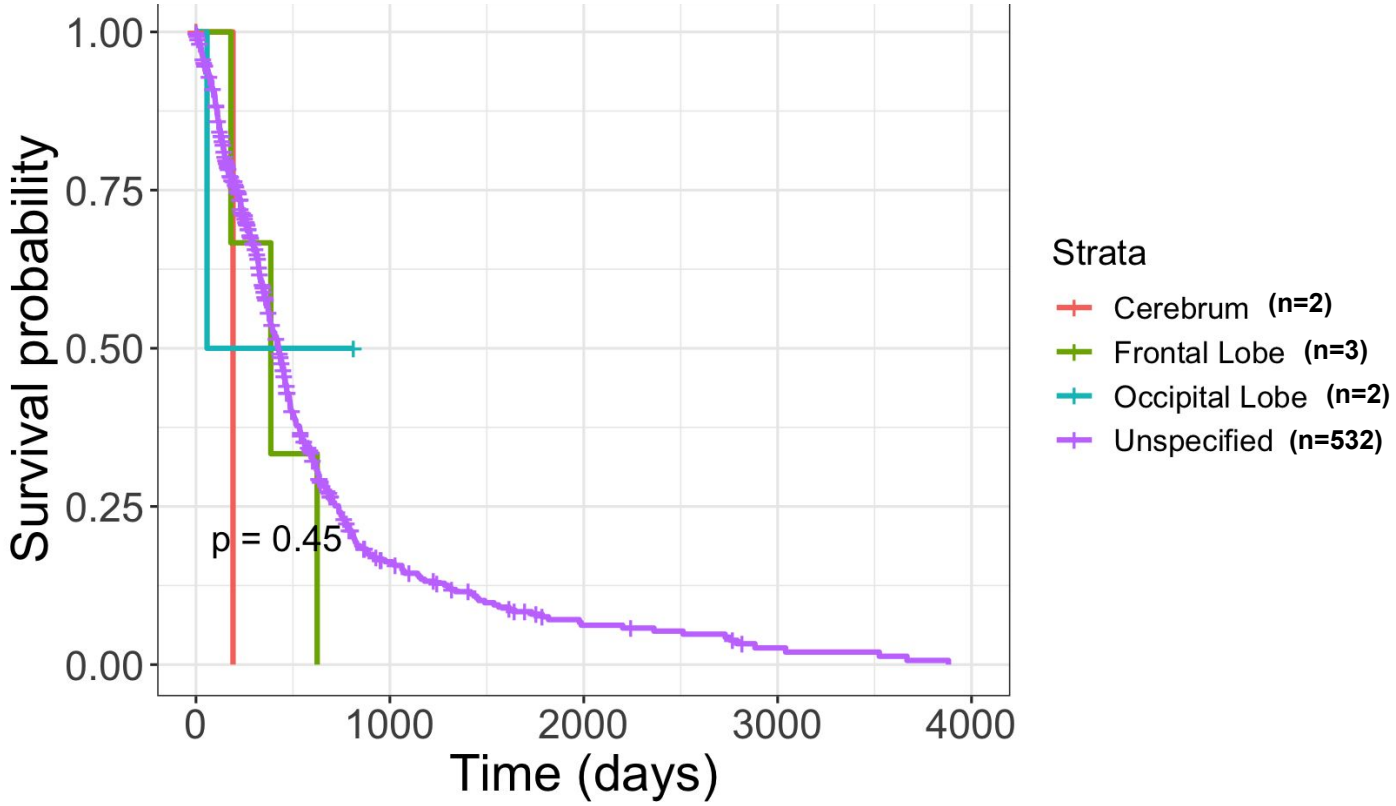
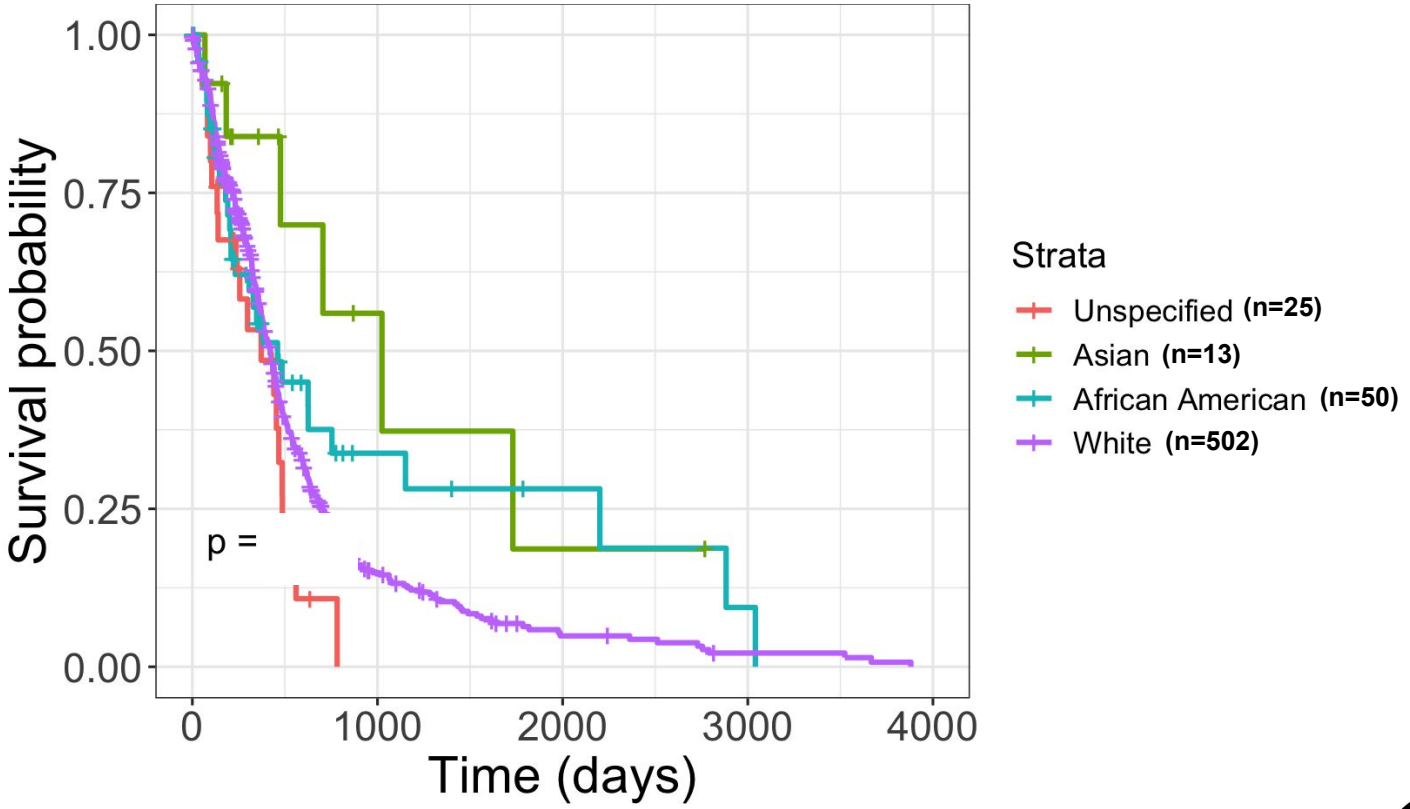
Tumor Site Is Not a Significant Discriminating Factor for GBM Prognosis



Potential Racial Differences in GBM Prognosis



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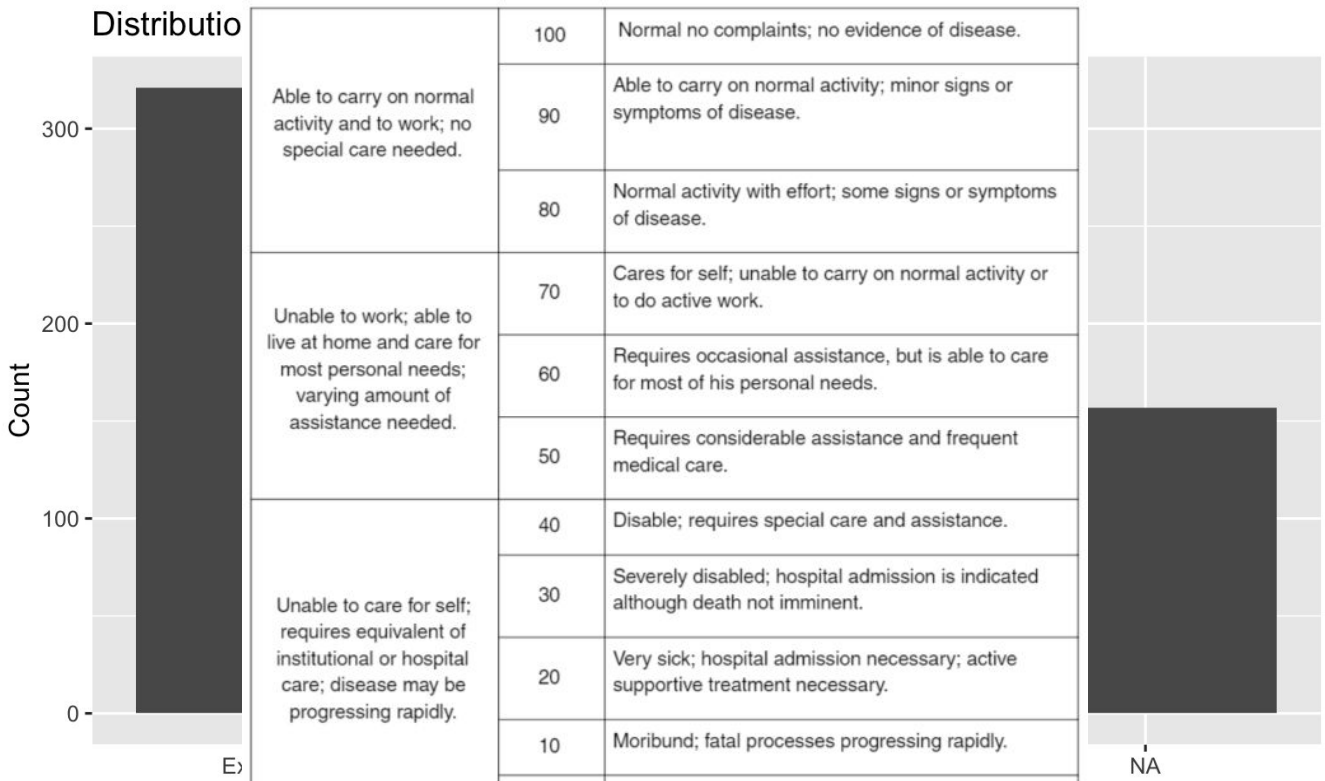
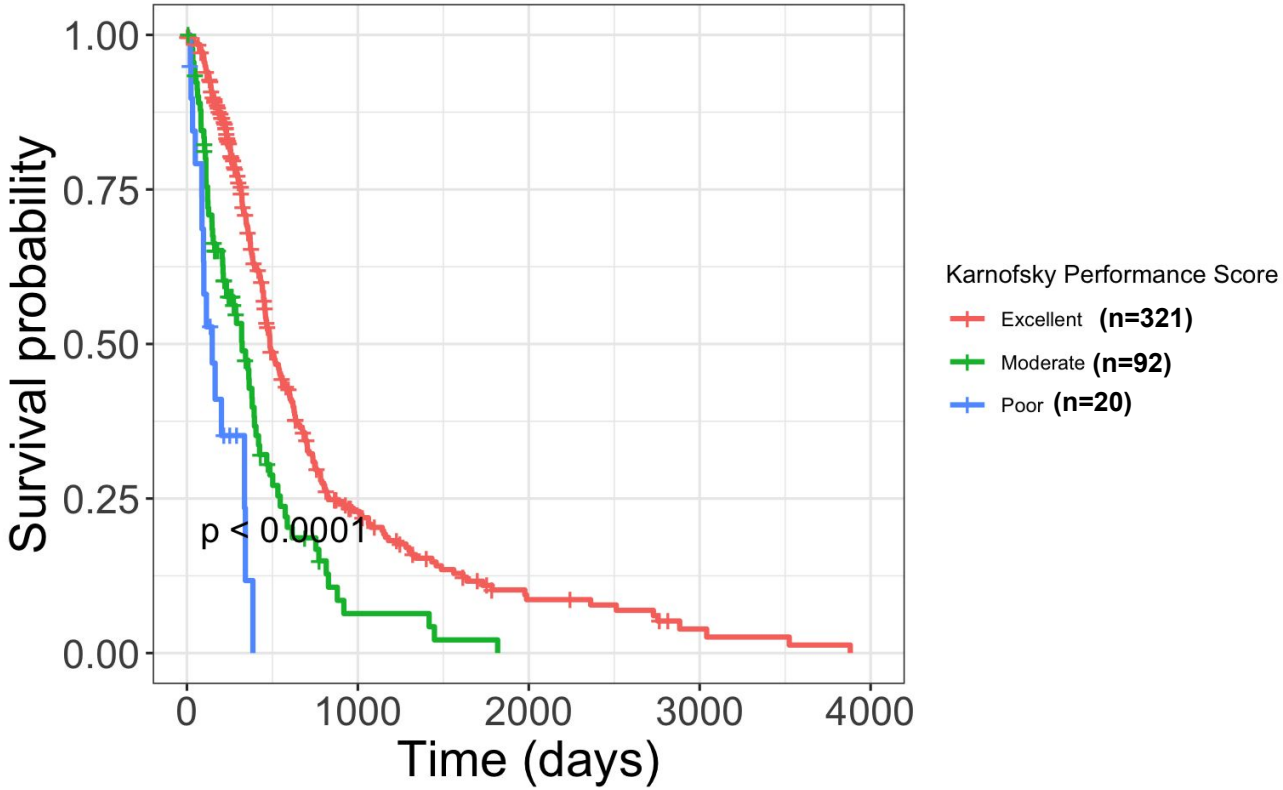


KARNOFSKY PERFORMANCE STATUS SCALE DEFINITIONS RATING (%) CRITERIA

Able to carry on normal activity and to work; no special care needed.	100	Normal no complaints; no evidence of disease.
	90	Able to carry on normal activity; minor signs or symptoms of disease.
	80	Normal activity with effort; some signs or symptoms of disease.
Unable to work; able to live at home and care for most personal needs; varying amount of assistance needed.	70	Cares for self; unable to carry on normal activity or to do active work.
	60	Requires occasional assistance, but is able to care for most of his personal needs.
	50	Requires considerable assistance and frequent medical care.
Unable to care for self; requires equivalent of institutional or hospital care; disease may be progressing rapidly.	40	Disable; requires special care and assistance.
	30	Severely disabled; hospital admission is indicated although death not imminent.
	20	Very sick; hospital admission necessary; active supportive treatment necessary.
	10	Moribund; fatal processes progressing rapidly.
	0	Dead

Lower Karnofsky Scores Are Associated with Poor GBM Prognosis



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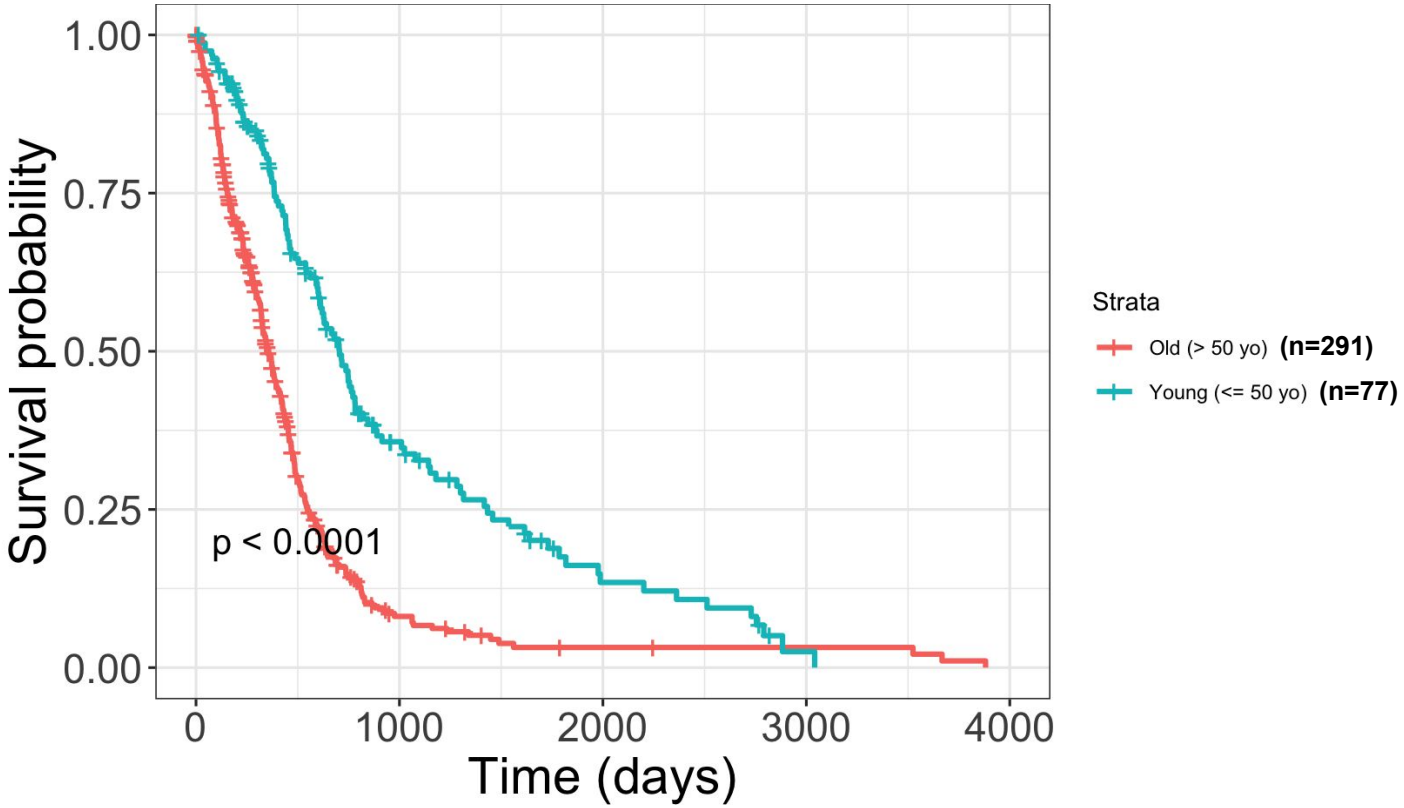
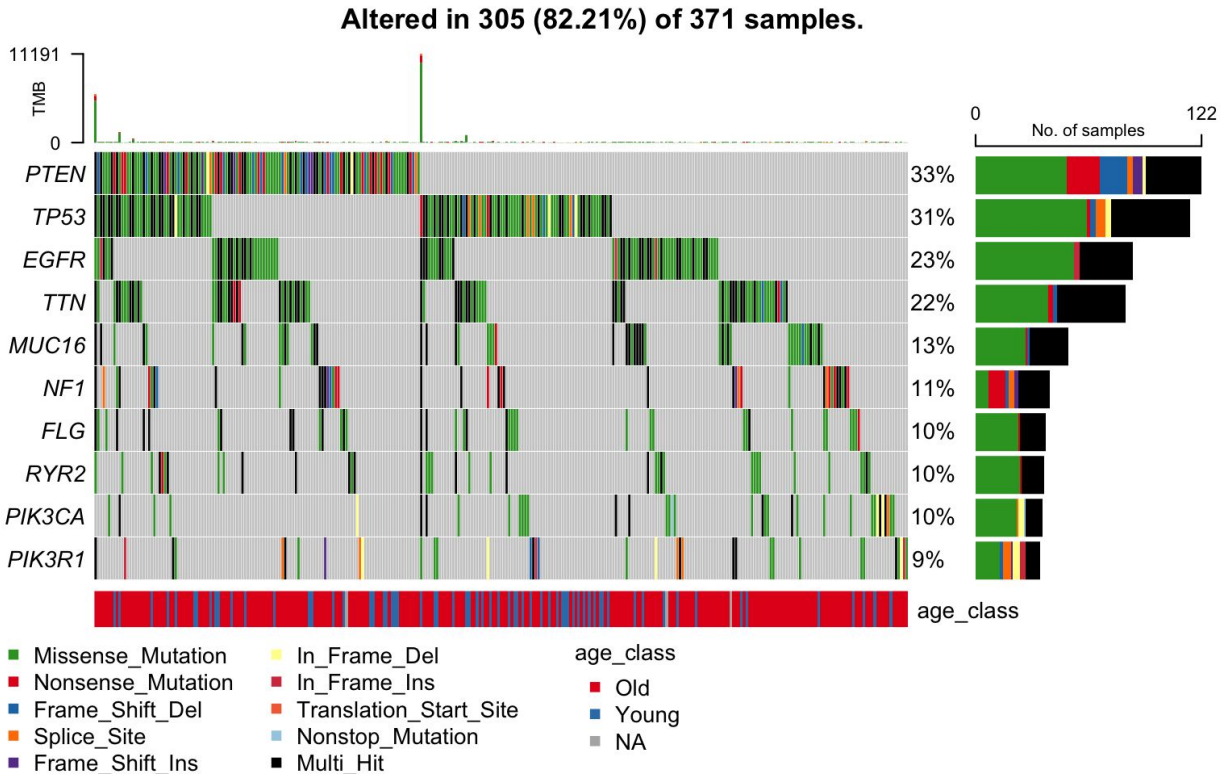
Older Patients (> 50 Years Old) Exhibit Poor GBM Prognosis



Overall GBM Patient Cohort Demonstrates Commonly Mutated Cancer Genes



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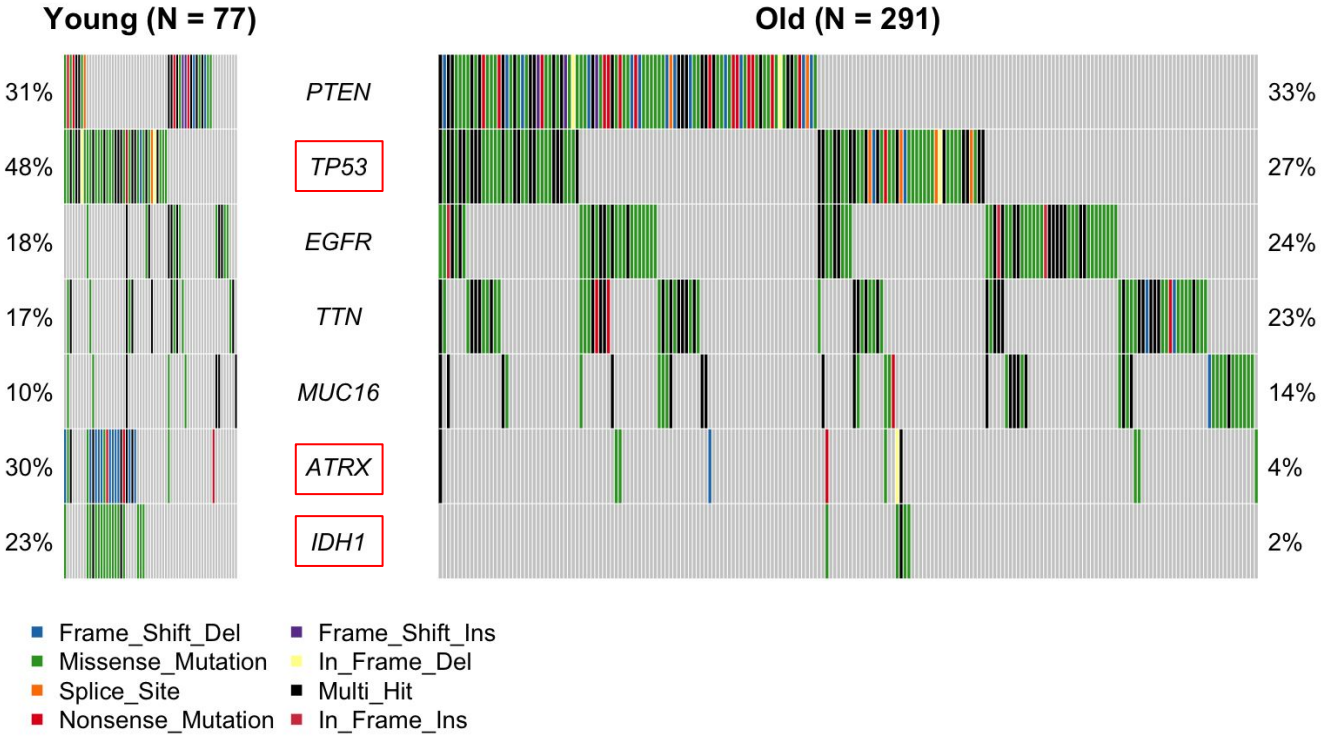
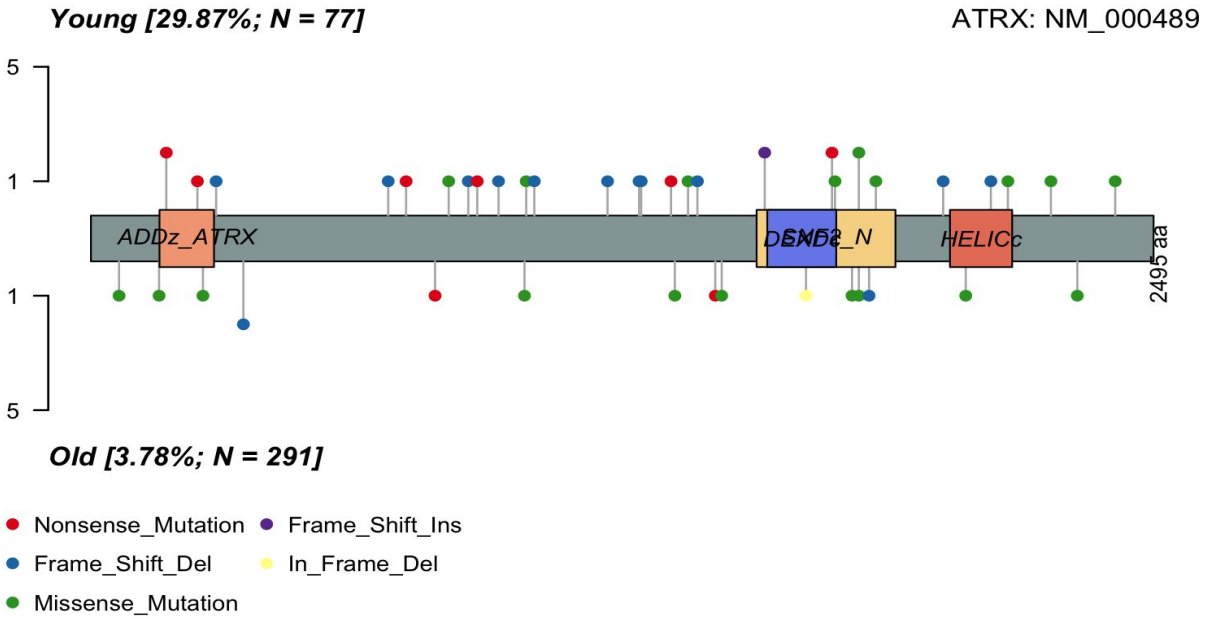
Age-Stratified GBM Patient Cohorts Demonstrate Unique Mutation Profiles



ATRX: Chromatin remodeling/DNA methylation



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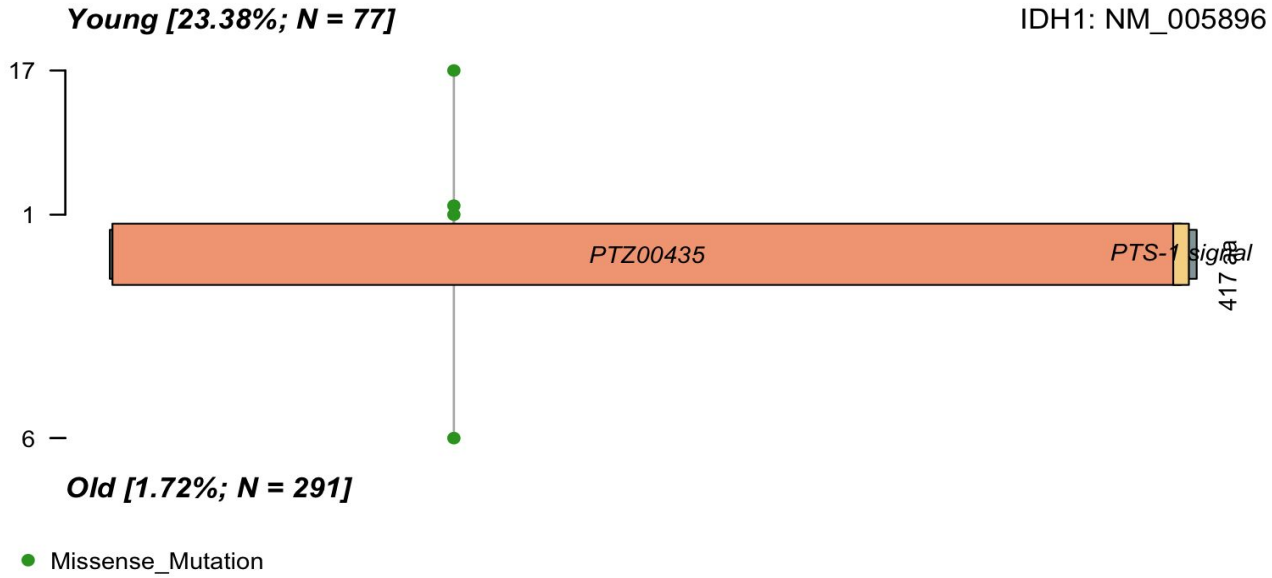
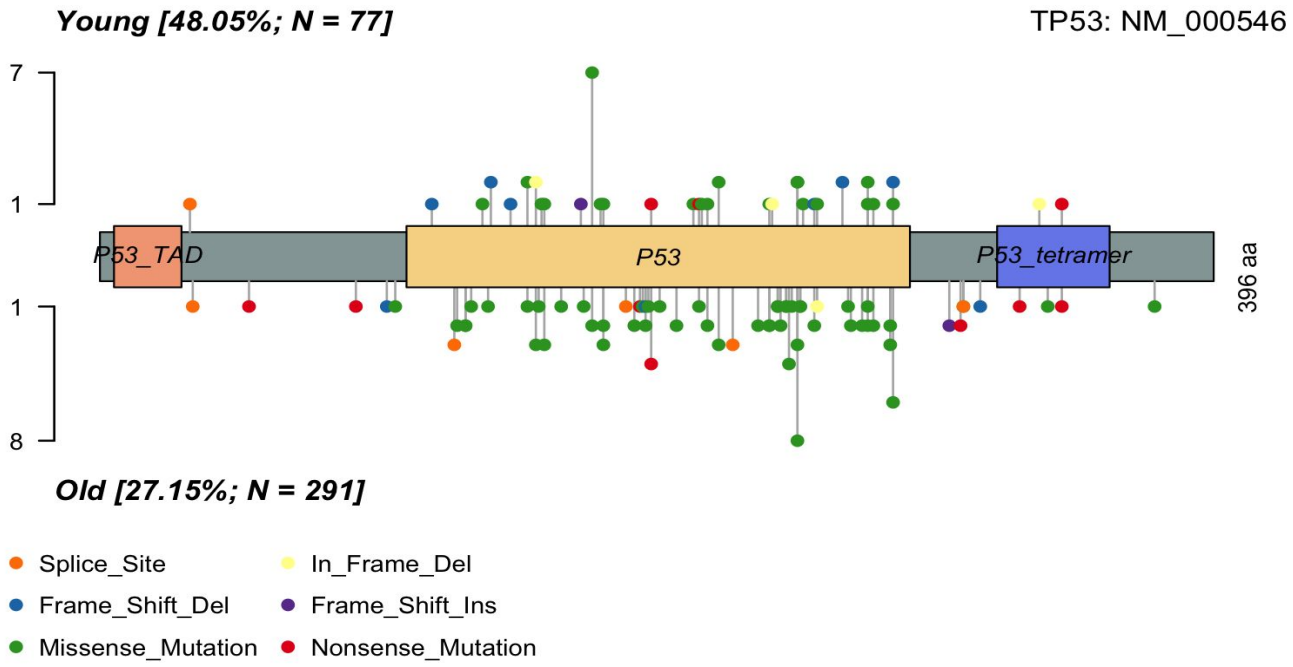
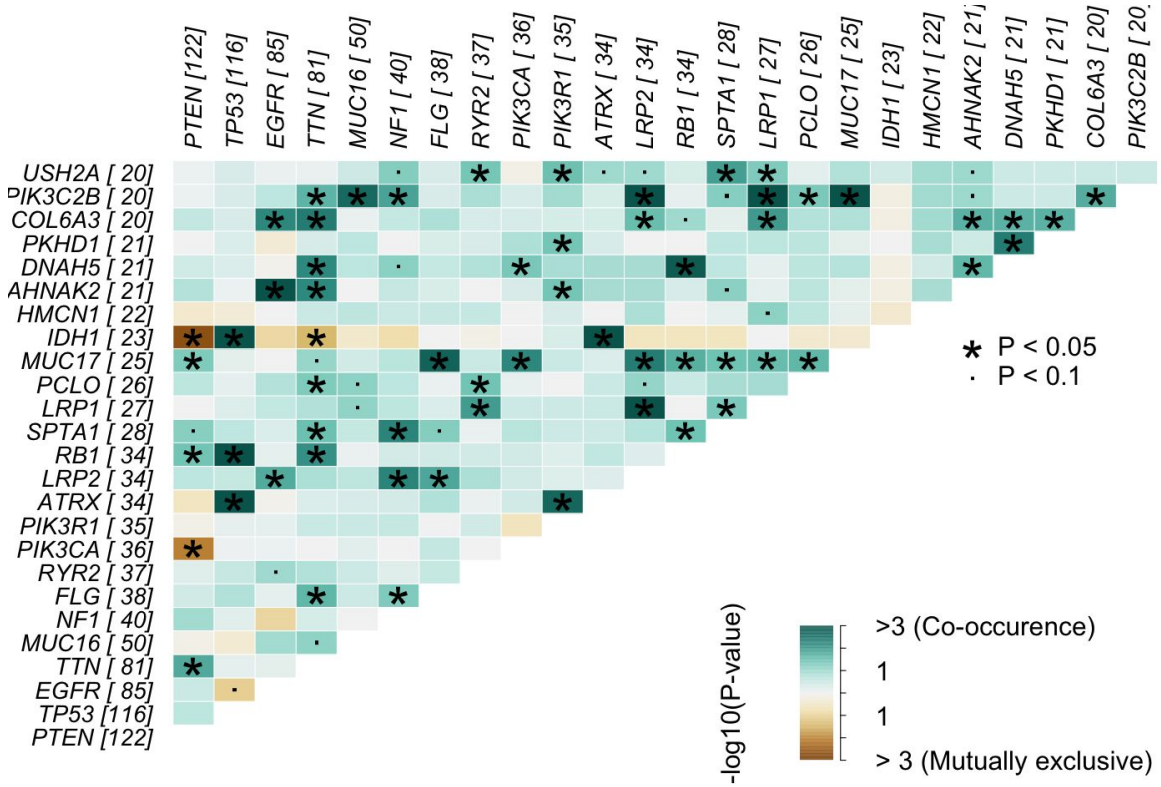
IDH1: Isocitrate dehydrogenase



TP53: general tumor suppressor gene



Overall Genomic Mutation Profile Shows Various Co-Occurrences and Mutual Exclusivities (n=368)



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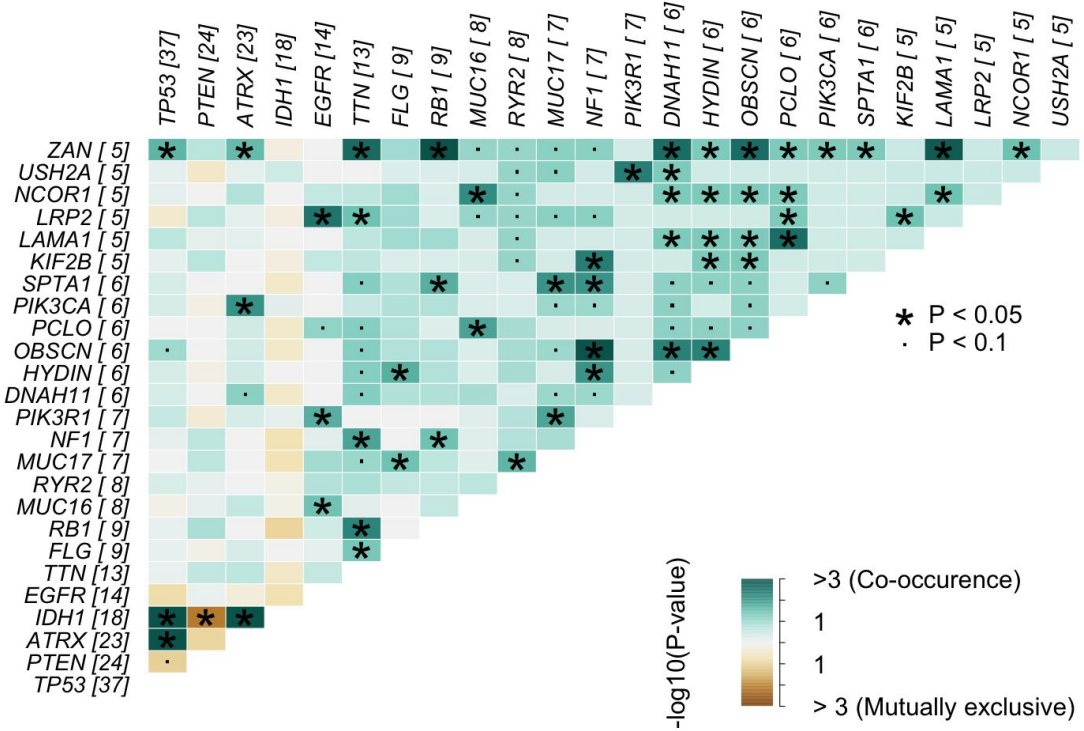
Young Genomic Mutation Profile Demonstrates Unique Mutual Exclusivity Signature (n=77)



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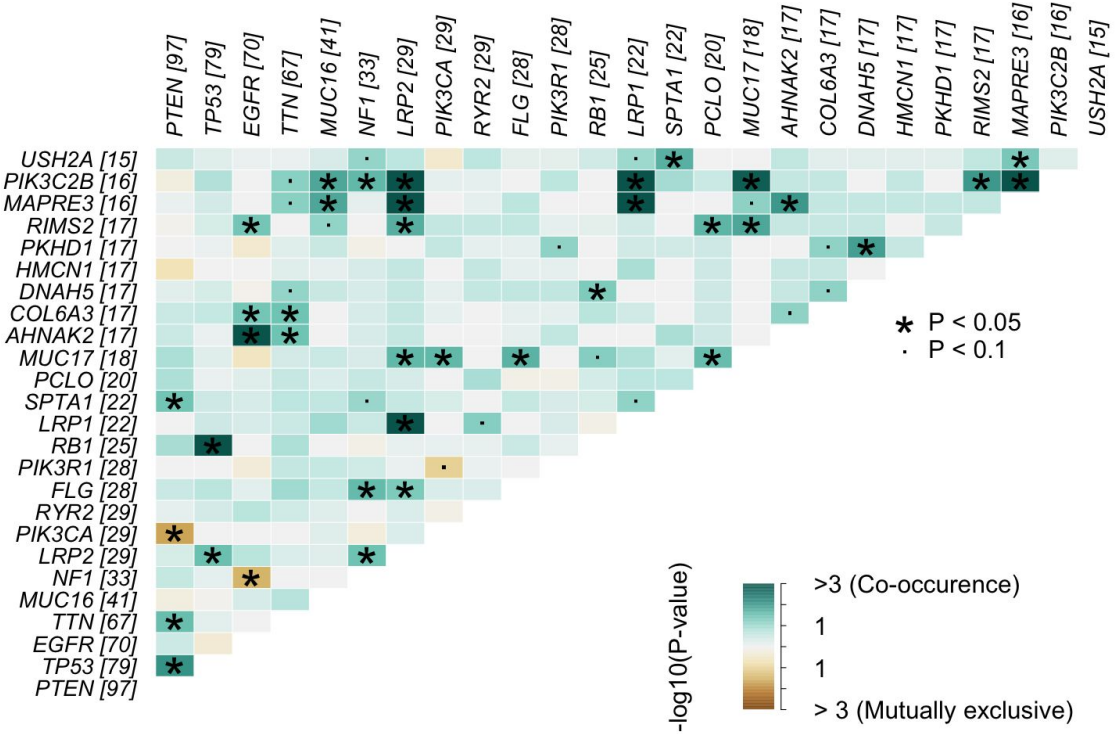
Old Genomic Mutation Profile Demonstrates Unique Mutual Exclusivity Signature (n=291)



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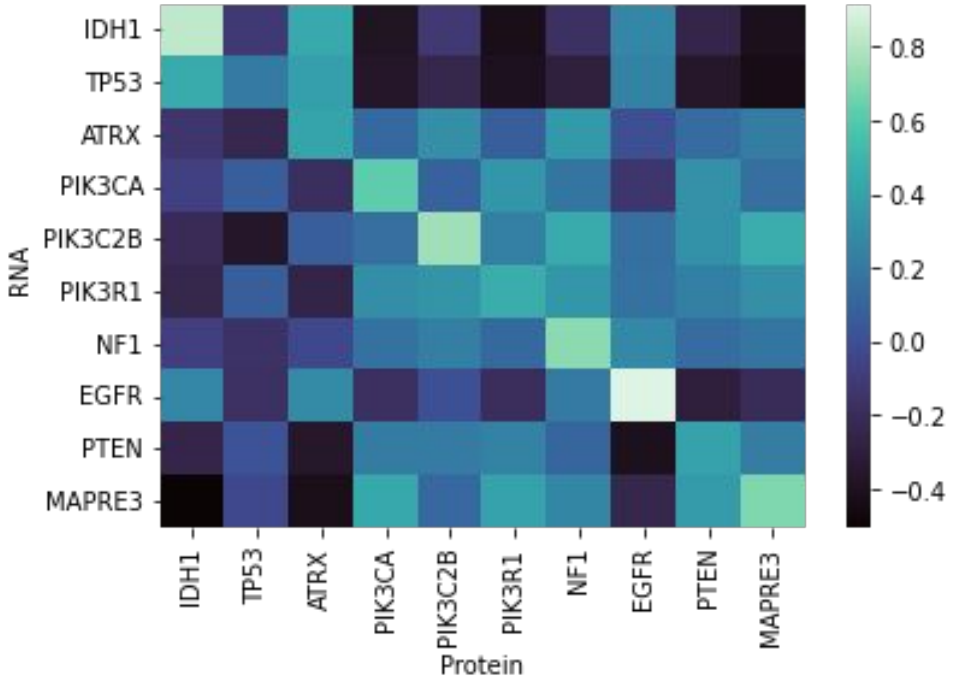
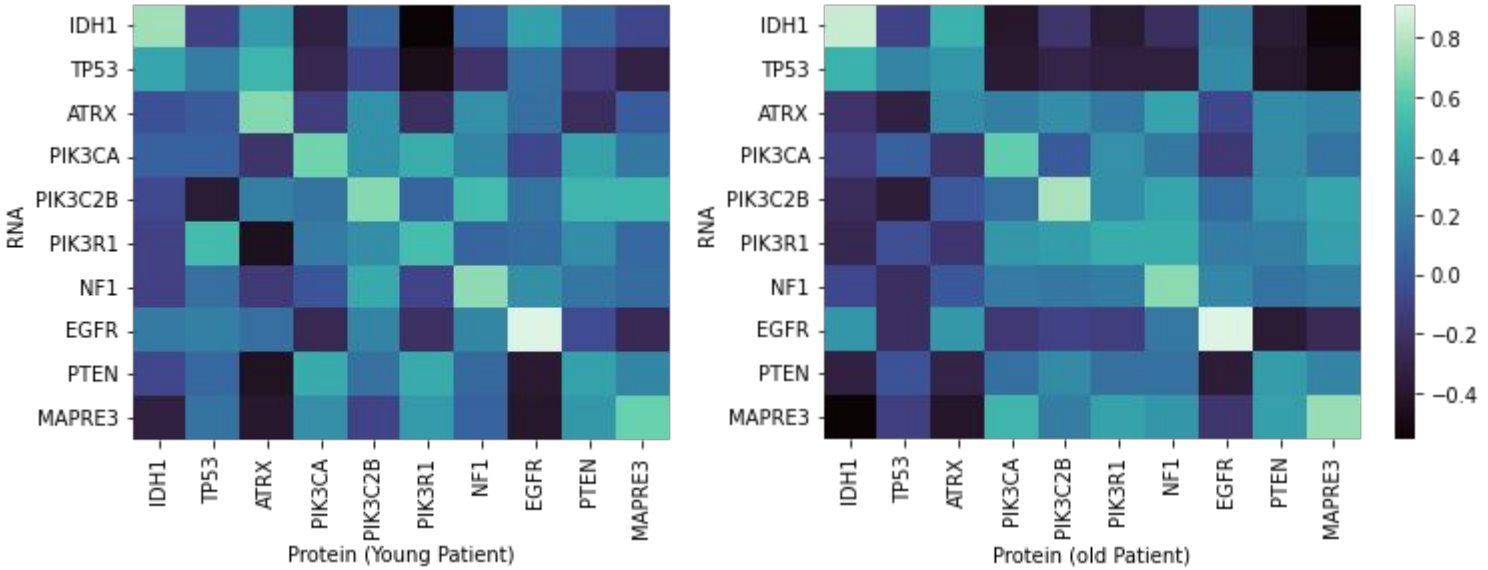
Overall


IDH1
TP53
ATRX
PIK3CA
PIK3C2B
PIK3R1
NF1
EGFR
PTEN
MAPRE3
RNA
Protein
0.8
0.6
0.4
0.2
0.0
−0.2
−0.4

Age-Stratified Heatmaps Don’t Demonstrate Significant Differences in Transcriptome/Proteome Expression



Young (n=29) **Old (n=81)**

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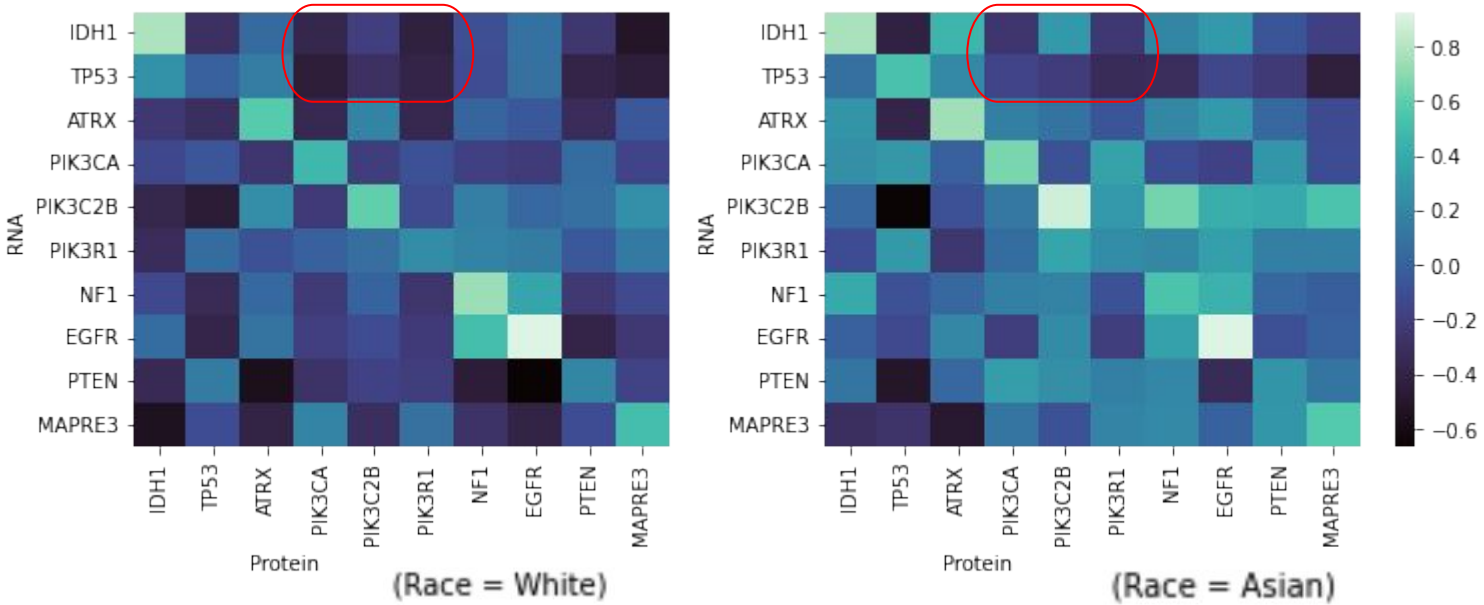
Race-Stratified Heatmaps Demonstrate Minor Differences in Transcriptome/Proteome Expression



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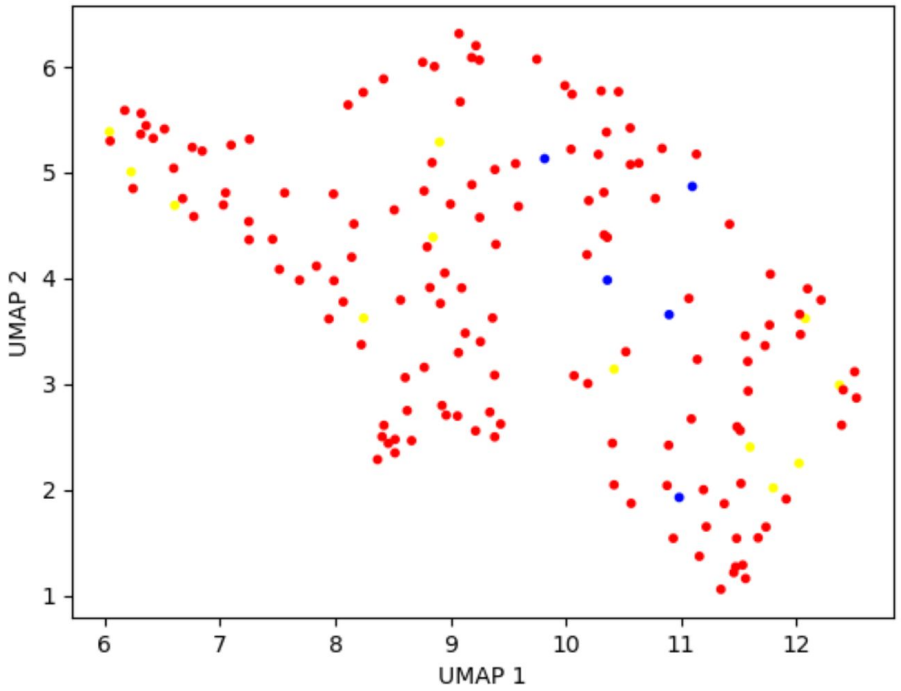
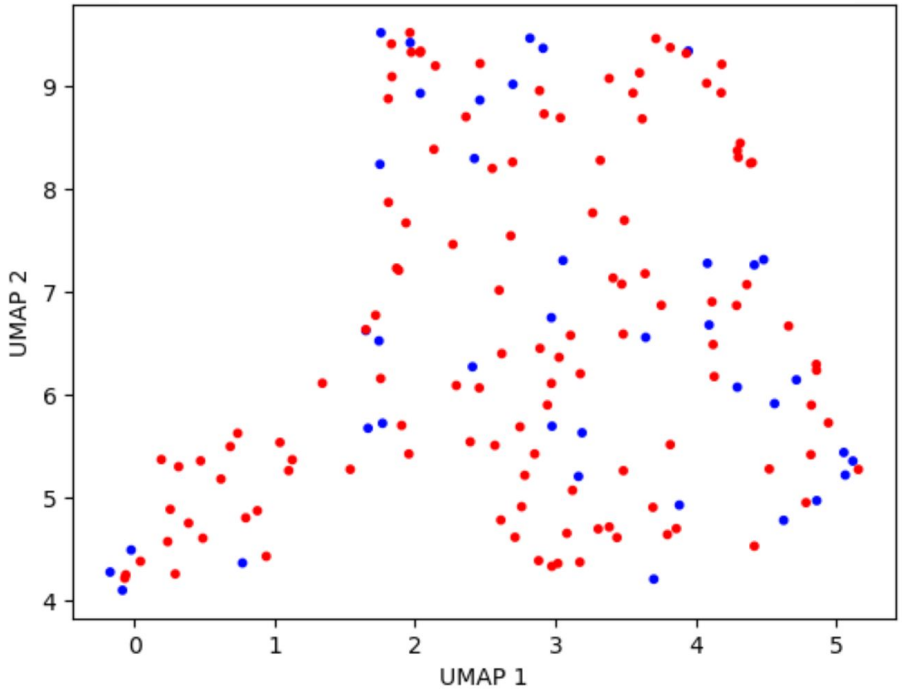
UMAP Plots of Race and Age Do Not Demonstrate Clear Clustering

RNA Expression by Patient Race



Legend: Asian White Not Specified

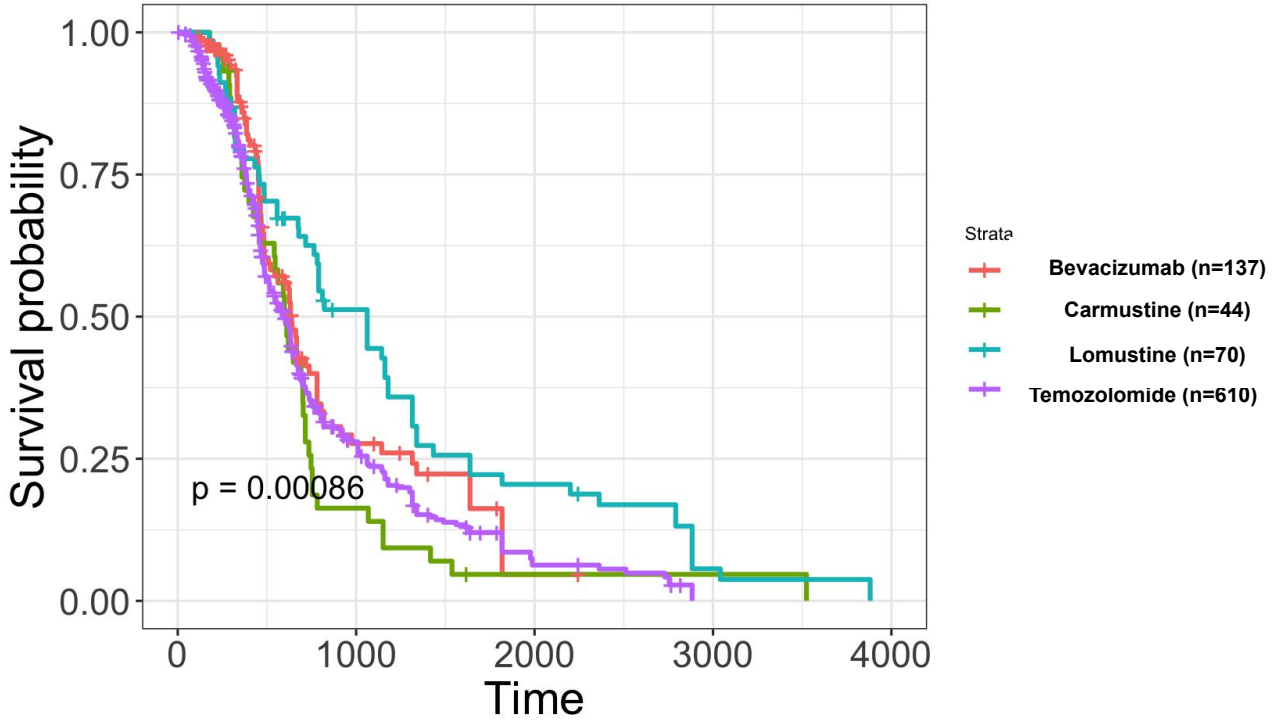
RNA Expression by Patient Age



Legend: Young Old

Conclusion

Patient age is a statistically significant prognostic factor for GBM.



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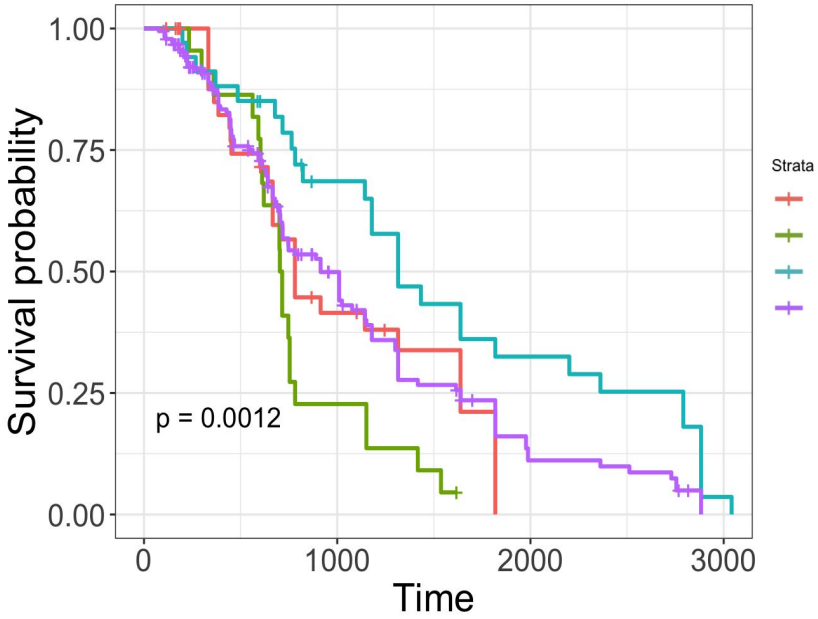
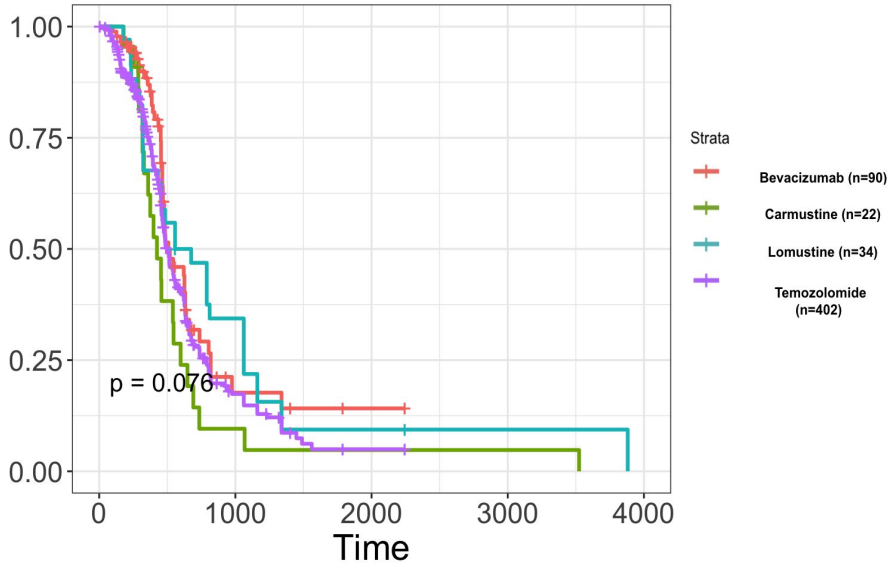
Conclusion

Patient age can inform us regarding efficacy of different treatments for each patient.



Young (n=294)



Old (n=548)

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Q&A Segment