

cBioPortal Tutorial #3: Patient View

Investigate individual patients or samples in detail

Tutorial Objectives

- Show different routes to get to patient view
- Walk through each of the possible tabs in patient view
 - Summary
 - Pathways
 - Clinical Data
 - Genomic Evolution
 - Pathology Report
 - Tissue Image
- Highlight the different types of information available in different studies
- Show an example of the insights that can be found from patient view

Option # 1 to get to patient view:

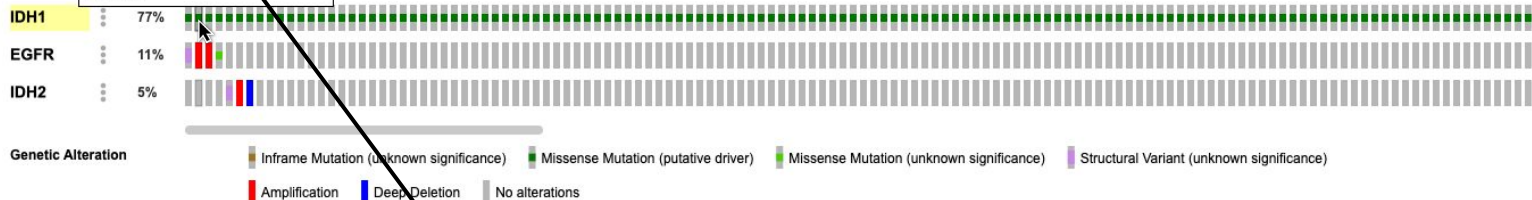
Anywhere you see a patient or sample ID, that ID is a link to patient view for that case.

See next slide for examples.

OncoPrint Cancer Types Summary Mutual Exclusivity Plots Mutations Co-expression Comparison/Survival CN Segments Pathways Download

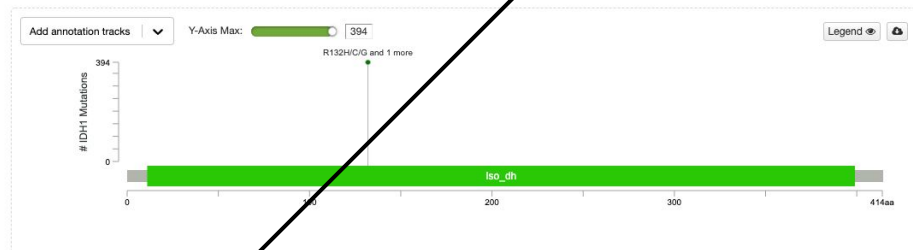
TCGA-CS-5393

Mutation: IDH1 R132H
 Profiled in all selected molecular profiles.



Click on any of these sample/patient IDs

IDH1 EGFR IDH2



394 Mutations (page 1 of 16)

Sample ID	Cancer Type Detailed	Protein Change	Annotation	Mutation Type	Copy #
TCGA-DB-5276-01	Astrocytoma	R132C	Missense	Missense	Diploid
TCGA-DB-5276-02	Oligoastrocytoma	R132C	Missense	Missense	Diploid
TCGA-DB-A44F-01	Astrocytoma	R132C	Missense	Missense	Diploid
TCGA-DB-A4XF-01	Astrocytoma	R132C	Missense	Missense	Diploid
TCGA-DB-A64S-01	Oligoastrocytoma	R132C	Missense	Missense	Diploid
TCGA-DB-A75S-01	Astrocytoma	R132C	Missense	Missense	Diploid
TCGA-DB-A105-01	Astrocytoma	R132C	Missense	Missense	Diploid

OncoPrint Cancer Types Summary Mutual Exclusivity Plots Mutations Co-expression Comparison/Survival CN Segments Pathway

Copy Number Profile Putative copy-number alteration... Gene EGFR Filter categories Select... Sort Categories by Median Swap Axes

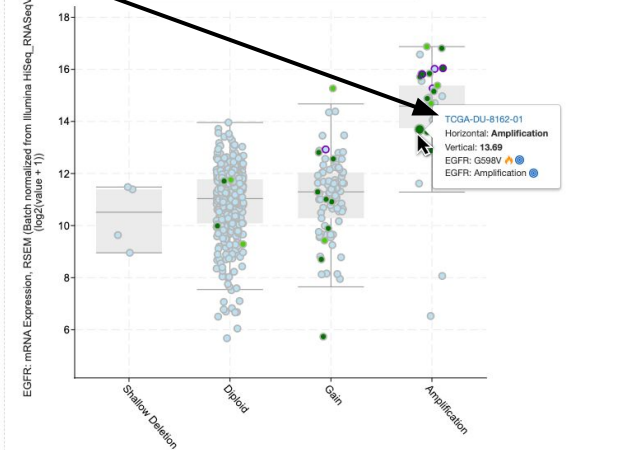
Data Type Copy Number Copy Number Profile Putative copy-number alteration... Gene EGFR Filter categories Select... Sort Categories by Median Swap Axes

Data Type mRNA mRNA Profile mRNA Expression, RSEM (Batch normalized from Illumina HiSeq_RNASeqV2) Log Scale Gene EGFR

Search Case(s)

Showing 511 samples with data in both profiles (axes)

Color samples by: EGFR Mutation Type * Structural Var



TCGA-DU-8162-01
 Horizontal: Amplification
 Vertical: 13.69
 EGFR: G598V
 EGFR: Amplification

Option #2 to get to patient view:

Use the study summary page to filter down to cases of interest. Then click the “view the selected patients” button.

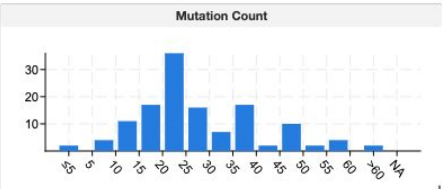
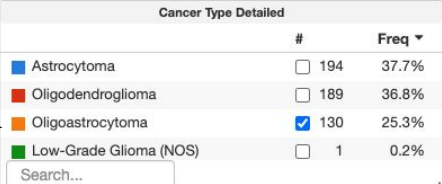
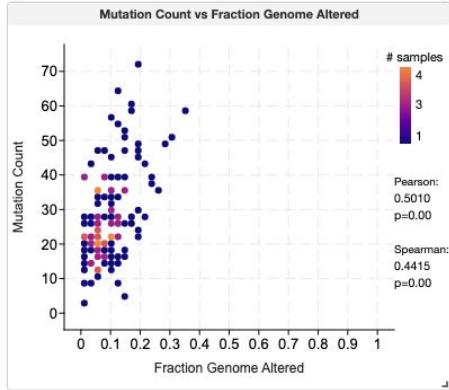
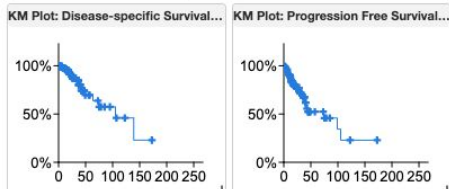
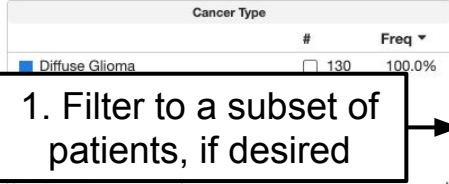
See next slide for example.

Cancer Type Detailed : **Oligoastrocytoma**

Clear All Filters



Summary Clinical Data CN Segments



Mutated Genes (130 profiled samples)

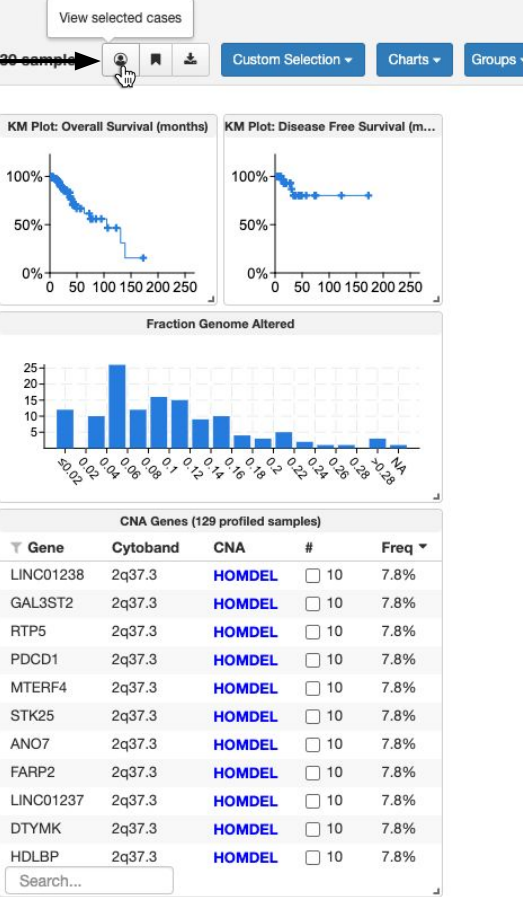
Gene	# Mut	#	Freq
IDH1	109	109	83.8%
TP53	104	75	57.7%
ATRX	72	66	50.8%
CIC	25	22	16.9%
TTN	20	18	13.8%
MUC16	13	12	9.2%
FUBP1	10	9	6.9%
ARID1A	9	8	6.2%
EGFR	9	7	5.4%
NF1	9	7	5.4%
SPAG17	7	7	5.4%

Molecular

Fusions	130	100.0%
mRNA expression z-scores relativ...	130	100.0%
Mutations	130	100.0%
Putative arm-level copy-number fr...	130	100.0%
mRNA expression z-scores relativ...	130	100.0%
mRNA Expression, RSEM (Batch ...	130	100.0%
Microbiome Signatures (log RNA ...	130	100.0%
Log2 copy-number values	129	99.2%
Putative copy-number alterations ...	129	99.2%
Protein expression z-scores (RPPA)	114	87.7%
Protein expression (RPPA)	114	87.7%

Structural Variant Genes (130 profiled samples)

Gene	# SV	#	Freq
SEPTIN14	3	3	2.3%
KIF21B	2	2	1.5%
KCNJ6	2	2	1.5%
UBR1	2	2	1.5%
CNN2	2	2	1.5%
SCAMP2	2	2	1.5%
TTC3	2	2	1.5%
YJU2	2	2	1.5%
EGFR	2	2	1.5%
FGFR3	2	2	1.5%
SHC2	2	2	1.5%



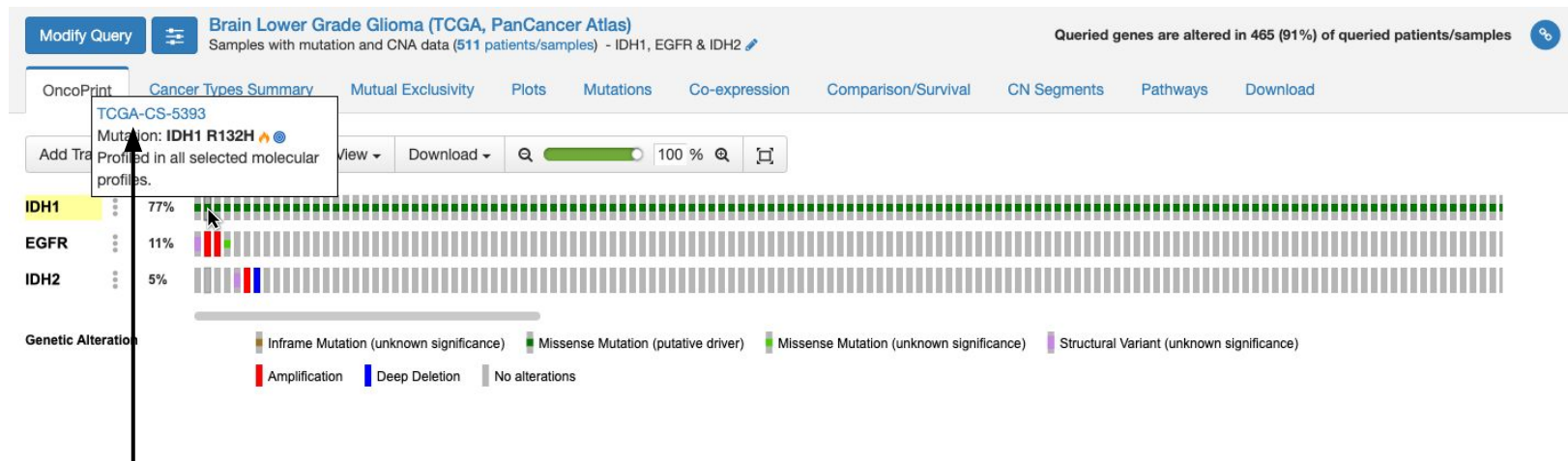
2. Click on this button to view the selected patients

No matter how you get to patient view, you will be taken to the summary tab.

Depending on the study, the other tabs in patient view may or may not be present.

In this tutorial we will look at patient view in two different studies to highlight the different kinds of data that may be available.

Example 1: Brain Lower Grade Glioma (TCGA, PanCancer Atlas)

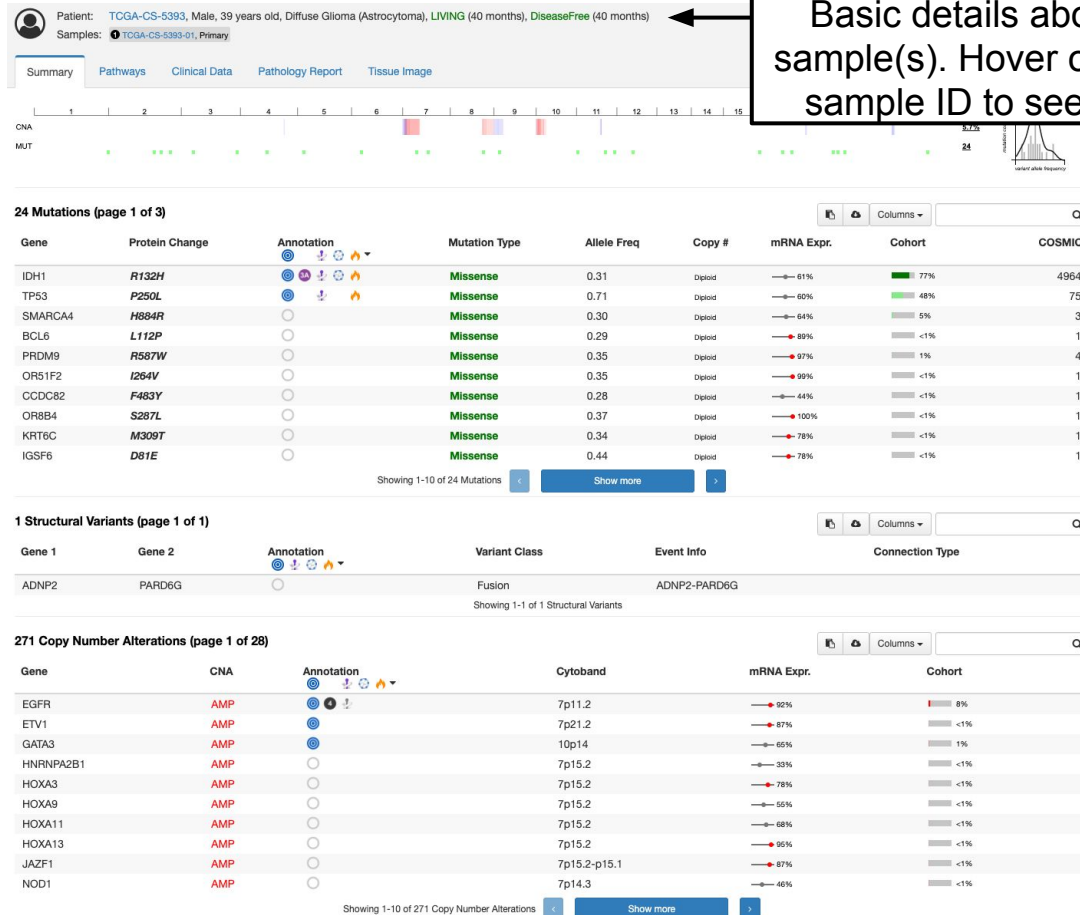


This is the same query that we used in the single study query tutorial. Hover over a case of interest and then click on the patient ID.

Patient View, Example 1: Summary

Figure showing where called CNA and mutations are across the genome. Hover over any of these for more details.

Lists of all called mutations, structural variants and CNAs (amplifications and deep deletions only).



Basic details about the patient and sample(s). Hover over the patient ID or sample ID to see more information.

Copy, download, add/remove columns or search.

Patient View, Example 1: Pathways

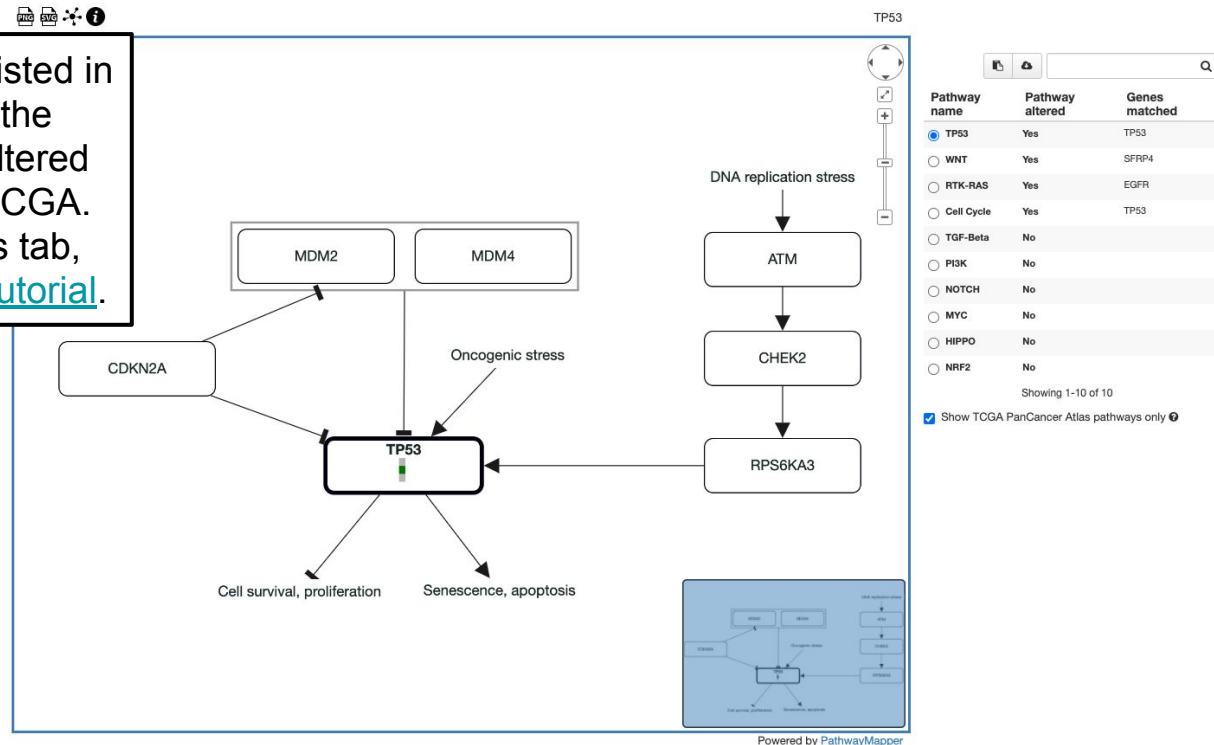
Patient: [TCGA-CS-5393](#), Male, 39 years old, Diffuse Glioma (Astrocytoma), [LIVING](#) (40 months), [DiseaseFree](#) (40 months) [Brain Lower Grade Glioma \(TCGA, PanCancer Atlas\)](#)

Samples: [TCGA-CS-5393-01](#), Primary

[Summary](#) [Pathways](#) [Clinical Data](#) [Pathology Report](#) [Tissue Image](#)



Explore the alterations listed in the Summary tab in the context of frequently altered pathways defined by TCGA. For more detail on this tab, refer to the [Pathways Tutorial](#).



Patient View, Example 1: Clinical Data

Patient: **TCGA-CS-5393**, Male, 39 years old, Diffuse Glioma (Astrocytoma), **LIVING** (40 months), **DiseaseFree** (40 months) Brain Lower Grade Glioma (TCGA, PanCancer Atlas)

Samples: **TCGA-CS-5393-01**, Primary

[Summary](#) [Pathways](#) [Clinical Data](#) [Pathology Report](#) [Tissue Image](#)

All available patient-level clinical information

Patient

Attribute	Value
Overall Survival Status	0:LIVING
Birth from Initial Pathologic Diagnosis Date	-14418.0
Buffa Hypoxia Score	-25
Center of sequencing	Thomas Jefferson University
Diagnosis Age	39.0
Disease Free (Months)	40.174902193
Disease Free Status	0:DiseaseFree
Disease-specific Survival status	0:ALIVE OR DEAD TUMOR FREE
Form completion date	3/16/11
ICD-10 Classification	C71.9
In PanCan Pathway Analysis	Yes
Informed consent verified	Yes
International Classification of Diseases for Oncology, Third Edition ICD-O-3 Histology Code	9401/3
International Classification of Diseases for Oncology, Third Edition ICD-O-3 Site	
Last Alive Less Initial Pathologic Diagnosis Date Calculated Day Value	
Last Communication Contact from Initial Pathologic Diagnosis Date	
Months of disease-specific survival	
Neoadjuvant Therapy Type Administered Prior To Resection Text	
New Neoplasm Event Post Initial Therapy Indicator	
Number of Samples Per Patient	
Other Patient ID	
Overall Survival (Months)	
Person Neoplasm Cancer Status	
Prior Diagnosis	
Progress Free Survival (Months)	
Progression Free Status	
Race Category	

Below the patient-level information is sample-level information. Patients with multiple samples will have multiple columns in this table.

Samples

Attribute	TCGA-CS-5393-01
Mutation Count	24
Fraction Genome Altered	0.0569
MSI MANTIS Score	0.2715
MSIsensor Score	0
Sample Type	Primary
Aneuploidy Score	0
Cancer Type	Diffuse Glioma
Cancer Type Detailed	Astrocytoma
Neoplasm Histologic Grade	G3
Oncotree Code	DIFG
Somatic Status	Matched
Tissue Prospective Collection Indicator	No

Patient View, Example 1: Pathology Report

Patient: TCGA-CS-5393, Male, 39 years old, Diffuse Glioma (Astrocytoma), LIVING (40 months), DiseaseFree (40 months) Brain Lower Grade Glioma (TCGA, PanCancer Atlas)

Samples: TCGA-CS-5393-01, Primary

Summary Pathways Clinical Data Pathology Report Tissue Image

Note: Pathology Reports are only available for TCGA studies.

TCGA-CS-5393

SURGICAL PATHOLOGY REPORT

FINAL DIAGNOSIS:

1. Left temporal parietal tumor: Anaplastic astrocytoma, grade III of IV (WHO scale), see microscopic description, SEE NOTE

Comment:
The proliferation index of 7.2% is within the expected range for an anaplastic astrocytoma, grade III.

This diagnostic report has been personally interpreted by the signatory of record.

Microscopic Description:
The tumor consists of a moderately pleomorphic and highly infiltrative proliferation of astrocytes.
There are rare mitoses. There is no endothelial proliferation or necrosis. Immunohistochemistry for the proliferation antigen ki67 was performed as follows: Ten 250 x 250 micron fields were counted and the percentage of labeled nuclei determined. Over 1,000 cells were counted. The proliferation index ranged from 4.4% to 12.5% with an

Original pathology report, de-identified.

Patient View, Example 1: Tissue Image

Patient: [TCGA-CS-5393](#), Male, 39 years old, Diffuse Glioma (Astrocytoma), [LIVING](#) (40 months), [DiseaseFree](#) (40 months)
Samples: [TCGA-CS-5393-01](#), Primary

Summary Pathways Clinical Data Pathology Report **Tissue Image**

CANCER Digital Slide Archive
EMORY | WINSHIP CANCER INSTITUTE

LOGIN HELP

SLIDES <

Tree >

Thumbnails ^

Igg

TCGA-CS-5393

TCGA-CS-53...

TCGA-CS-53...

TCGA-CS-53...

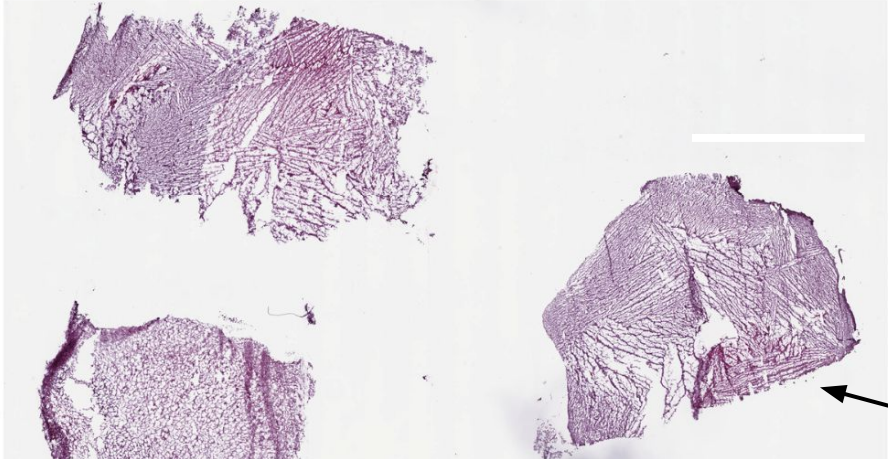
TCGA-CS-53...

Slides view ☐ Metadata view

Metadata Apply Filters Pathology Report Ap

No Labels Drawing Disabled

Layer: Default Layer



This tab integrates the [Cancer Digital Slide Archive](#).

Note: Tissue images are only available for TCGA studies.

Zoomable image of the tissue. When available, additional images can be selected from the list on the left.

Example 2: Low-Grade Gliomas (UCSF, Science 2014)

Low-Grade Gliomas (UCSF, Science 2014) [PubMed](#)

Whole exome sequencing of 23 grade II glioma tumor/normal pairs. [PubMed](#)

Click gene symbols below or enter here

Number of Samples Per Patient : or

Summary Clinical Data

Selected: 2 patients | 12 samples

Cancer Type Detailed

	#	Freq
<input checked="" type="checkbox"/> Glioblastoma	5	41.7%
<input checked="" type="checkbox"/> Oligoastrocytoma	4	33.3%
<input checked="" type="checkbox"/> Oligodendroglioma	3	25.0%

Genomic Profile Sample Counts

Molecular Profile

Mutations

Number of Samples...

	#	Freq
<input type="checkbox"/> 2	17	73.9%
<input type="checkbox"/> 4	3	13.0%
<input type="checkbox"/> 3	1	4.3%
<input type="checkbox"/> 5	1	4.3%
<input checked="" type="checkbox"/> 7	1	4.3%

Search...

Number of Samples Per Patient

Search...

1. Filter the study to a subset of patients, if desired

Low-Grade Gliomas (UCSF, Science 2014) [PubMed](#)

Whole exome sequencing of 23 grade II glioma tumor/normal pairs. [PubMed](#)

Click gene symbols below or enter here

Number of Samples Per Patient : or

Summary Clinical Data

Selected: 2 patients | 12 samples

Cancer Type Detailed

	#	Freq
<input checked="" type="checkbox"/> Glioblastoma	5	41.7%
<input checked="" type="checkbox"/> Oligoastrocytoma	4	33.3%
<input checked="" type="checkbox"/> Oligodendroglioma	3	25.0%

Genomic Profile Sample Counts

Molecular Profile

Mutations

Number of Samples Per Patient

Search...

2. Click on this button to "View selected cases"

Patient View, Example 2: Patient Summary

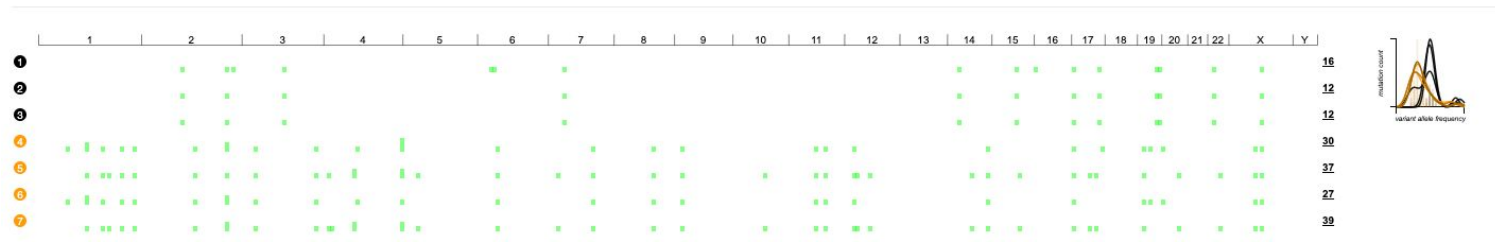
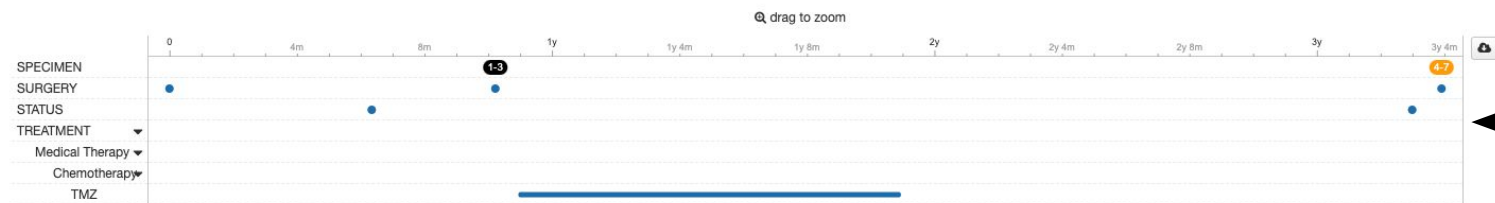
Patient: **P17**, Male, 27 years old, Glioma, **LIVING** (59 months)

Samples: **1** P17_Pr1_A, Primary (Oligodendroglioma) **2** P17_Pr1_B, Primary (Oligodendroglioma) **3** P17_Pr1_C, Primary (Oligodendroglioma) **4** P17_Rec1_A, Recurrence (Glioblastoma)
5 P17_Rec1_B, Recurrence (Glioblastoma) **6** P17_Rec1_C, Recurrence (Glioblastoma) **7** P17_Rec1_D, Recurrence (Glioblastoma)

Low-Grade Gliomas (UCSF, Science 2014)

« < 1 of 2 patients > »

Summary Genomic Evolution Pathways Clinical Data




63 Mutations (page 1 of 7)

Samples	Gene	Protein Change	Annotation	Mutation Type	Allele Freq	Cohort	COSMIC
1 2 3 4 5 6 7	IDH1	R132H		Missense	■■■■■	100%	4964
4 5 6 7	PIK3CA	H1047R		Missense	■■■■	8%	1983
1 2 3	TP53	C176F		Missense	■■■	90%	261
4 5 6 7	TP53	S127F		Missense	■■■	90%	65
1 2 3	ATRX	I1035Efs*5		FS del		82%	

This study has multiple samples per patient and extensive clinical data to generate this enhanced patient timeline.

[Link to this page](#)

Patient timeline showing surgeries, radiographic progression and treatments. Hover over any feature for additional information. Click the  to expand the timeline.

List of all mutations called. The first column ("Samples") shows which samples had a particular mutation. The Allele Freq column depicts the mutation frequency in each sample by the height of the bar.

Patient View, Example 2: Patient Summary

List of all samples for this patient. Hover on a sample ID for more details or click to get to a sample summary page (we'll do this in a few slides)

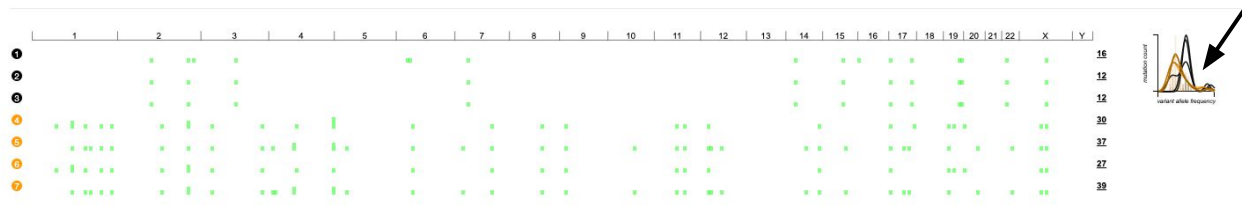
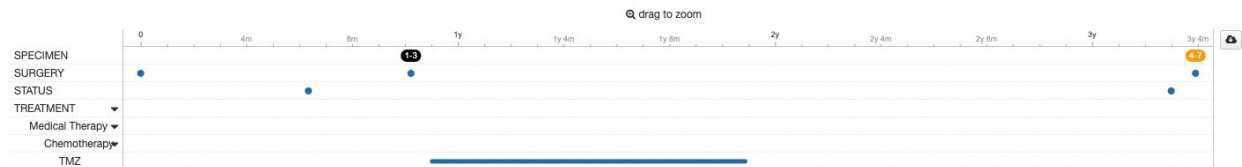
Patient: P17, Male, 27 years old, Glioma, LIVING (59 months)

Samples: P17_Primary_A, Primary (Oligodendroglioma) P17_Primary_B, Primary (Oligodendroglioma) P17_Primary_C, Primary (Oligodendroglioma) P17_Rec1_A, Recurrence (Glioblastoma) P17_Rec1_B, Recurrence (Glioblastoma) P17_Rec1_C, Recurrence (Glioblastoma) P17_Rec1_D, Recurrence (Glioblastoma)

Low-Grade Gliomas (UCSF, Science 2014)

< < 1 of 2 patients > >

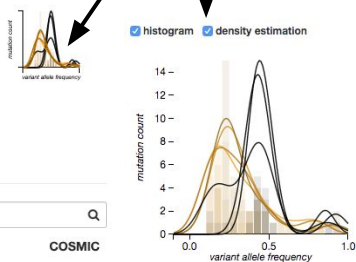
Summary Genomic Evolution Pathways Clinical Data



63 Mutations (page 1 of 7)

Samples	Gene	Protein Change	Annotation	Mutation Type	Allele Freq	Cohort	COSMIC
1 2 3 4 5 6 7	IDH1	R132H	Missense	Missense	100%	4964	
	PIK3CA	H1047R	Missense	Missense	8%	1983	
1 2 3 4 5 6 7	TP53	C176F	Missense	Missense	90%	261	
	TP53	S127F	Missense	Missense	90%	65	
1 2 3 4 5 6 7	ATRX	I1035Efs*5	FS del	FS del	82%		

Hover to see an enlarged version. It shows a histogram with overlaid density estimation of the allele frequency in each tumor sample.



Hover over a sample ID to see the plot for just that sample

Patient View, Example 2: Genomic Evolution

Patient: P17, Male, 27 years old, Glioma, LIVING (59 months)

Low-Grade Gliomas (UCSF, Science 2014)

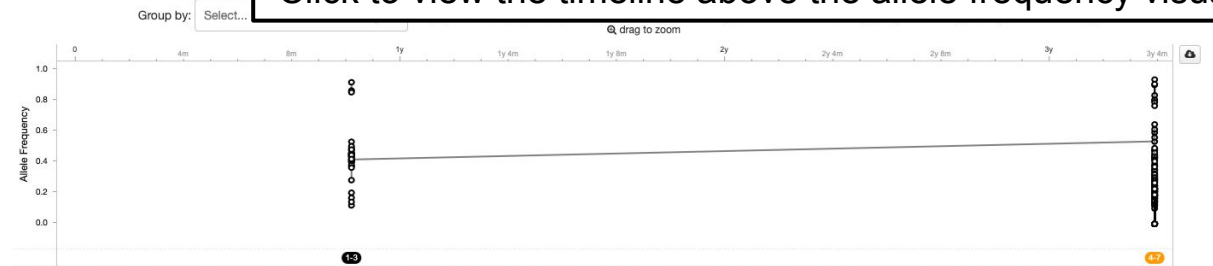
Samples: P17_Primary (Oligodendroglioma) P17_Primary (Oligodendroglioma) P17_Primary (Oligodendroglioma) P17_Primary (Oligodendroglioma)

P17_Primary (Oligodendroglioma) P17_Primary (Oligodendroglioma) P17_Primary (Oligodendroglioma) P17_Primary (Oligodendroglioma)

P17_Primary (Oligodendroglioma) P17_Primary (Oligodendroglioma) P17_Primary (Oligodendroglioma) P17_Primary (Oligodendroglioma)

Allele frequencies can be displayed as a Line Chart or Heatmap

Click to view the timeline above the allele frequency visualization



Show only selected mutations

63 Mutations (page 1 of 7)

Columns

Samples	Gene	Protein Change	Annotation	Mutation Type	Allele Freq	Cohort	COSMIC
P17_Primary	IDH1	R132H	<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div></div>	Missense	<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div></div> 100%	4964
	PIK3CA	H1047R	<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div></div>	Missense	<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div></div> 8%	1983
P17_Primary	TP53	C176F	<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div></div>	Missense	<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div></div> 90%	261
	TP53	S127F	<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div></div>	Missense	<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div></div> 90%	65
P17_Primary	ATRX	I1035Efs*5	<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div></div>	FS del	<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div></div> 82%	
	ATRX	K96Rfs*2	<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div></div>	FS del	<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div></div> 82%	
P17_Primary	ARNT	F427L	<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div></div>	Missense	<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div></div> 11%	
	KAT6B	M1961V	<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div></div>	Missense	<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div></div> 7%	
P17_Primary	NOTCH4	C1091W	<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div></div>	Missense	<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div></div> 5%	
	FAT1	A4224T	<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div></div>	Missense	<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div></div> 13%	

Showing 1-10 of 63 Mutations

Show more

The Genomic Evolution tab is present for any patient with 2 or more samples. This tab provides visualizations to examine how mutation allele frequencies vary among samples and change over time. The Timeline (on the Summary tab) can also be shown on this tab to put allele frequency changes in context.

Patient View, Example 2: Genomic Evolution - Line Chart

Patient: P17, Male, 27 years old, Glioma, **LIVING** (59 months)

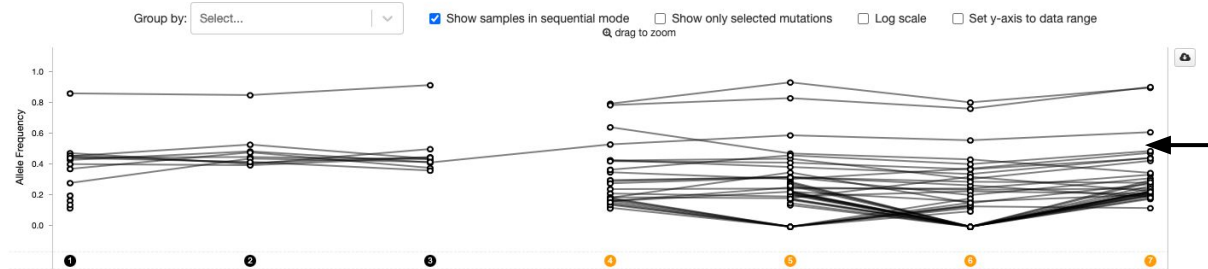
Samples: 1 P17_Pr1_A, Primary (Oligodendroglioma) 2 P17_Pr1_B, Primary (Oligodendroglioma) 3 P17_Pr1_C, Primary (Oligodendroglioma) 4 P17_Rec1_A, Recurrence (Glioblastoma) 5 P17_Rec1_B, Recurrence (Glioblastoma) 6 P17_Rec1_C, Recurrence (Glioblastoma) 7 P17_Rec1_D, Recurrence (Glioblastoma)

Low-Grade Gliomas (UCSF, Science 2014)

Summary Genomic Evolution Pathways Clinical Data

Line Chart Heatmap

Show Timeline



☐ Show only selected mutations 63 Mutations (page 1 of 7)

Samples	Gene	Protein Change	Annotation	Mutation Type	Allele Freq	Cohort	COSMIC
1 2 3 4 5 6 7	IDH1	R132H		Missense	■■■■■	100%	4964
1 2 3 4 5 6 7	PIK3CA	H1047R		Missense	■■■■■	8%	1983
1 2 3 4 5 6 7	TP53	C176F		Missense	■■■■■	90%	261
1 2 3 4 5 6 7	TP53	S127F		Missense	■■■■■	90%	65
1 2 3 4 5 6 7	ATRX	I1035Efs*5		FS del	■■■■■	82%	
1 2 3 4 5 6 7	ATRX	K96Rfs*2		FS del	■■■■■	82%	
1 2 3 4 5 6 7	ARNT	F427L		Missense	■■■■■	11%	
1 2 3 4 5 6 7	KAT6B	M1961V		Missense	■■■■■	7%	
1 2 3 4 5 6 7	NOTCH4	C1091W		Missense	■■■■■	5%	
1 2 3 4 5 6 7	FAT1	A4224T		Missense	■■■■■	13%	

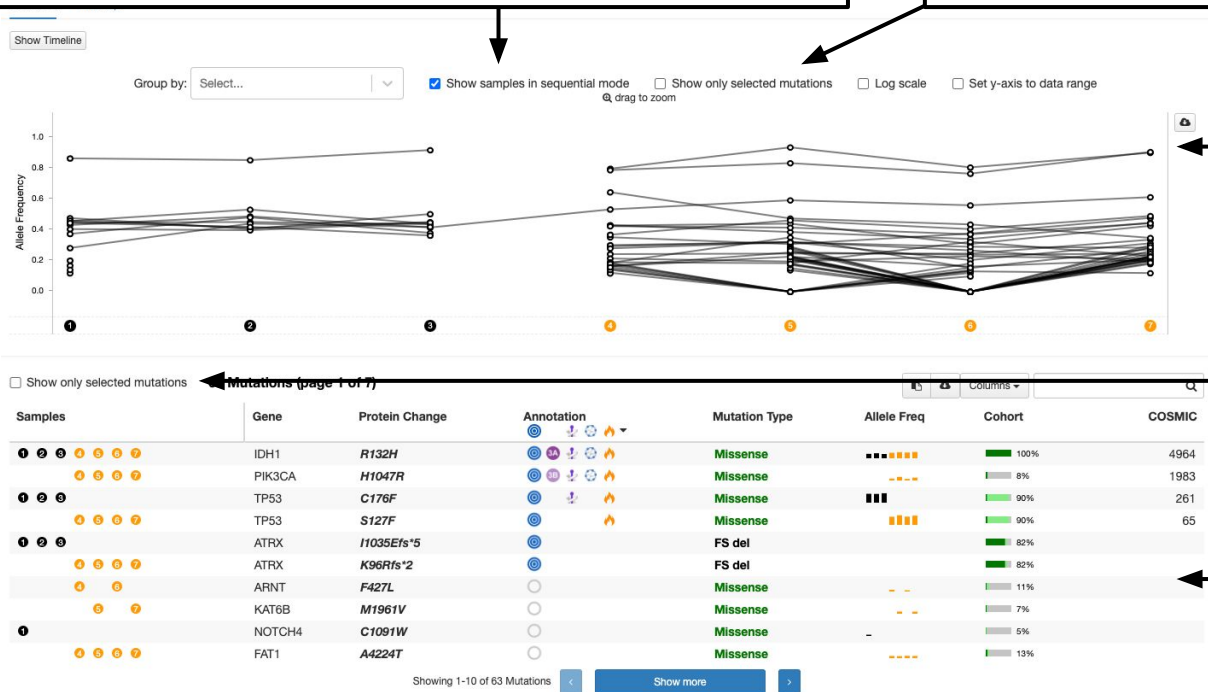
Showing 1-10 of 63 Mutations [Show more](#)

Each dot represents the allele frequency of a mutation in a sample. Lines connect mutations that are detected in multiple samples. Options above the chart enable customization.

Patient View, Example 2: Genomic Evolution - Line Chart

Change x-axis to show all samples equally spaced (below) or samples in real time (aligned with timeline, see first Genomic Evolution slide)

Click on mutations in the table below and then check this box to only see those mutations in the chart.



This chart and the mutation table are linked - hover or click on a mutation in the chart to see it highlighted in the table below.

Click on mutations in the chart above and then check this box to see only those mutations in the table.

Hover or click on a mutation in the table to see it highlighted in the chart above.

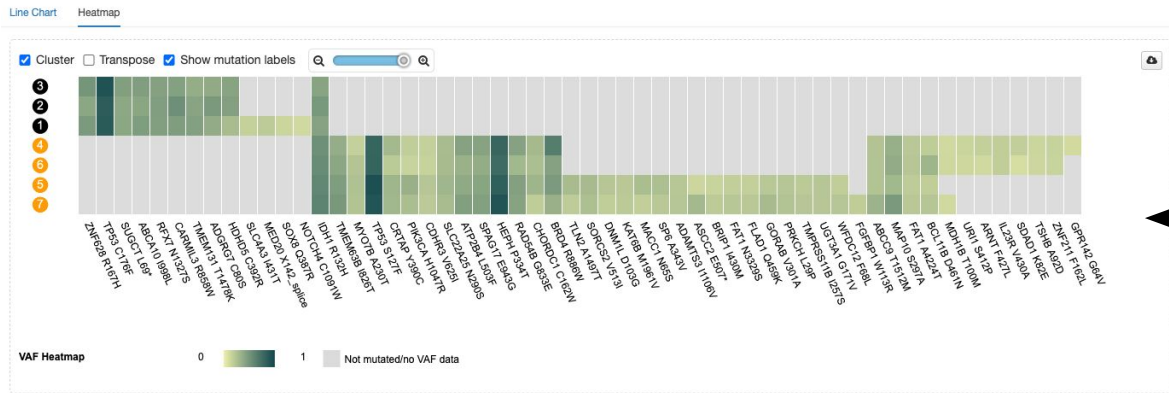
Patient View, Example 2: Genomic Evolution - Heatmap

Patient: P17, Male, 27 years old, Glioma, LIVING (59 months)

Low-Grade Gliomas (UCSF, Science 2014)

Samples: 1 P17_Pr1_A, Primary (Oligodendroglioma) 2 P17_Pr1_B, Primary (Oligodendroglioma) 3 P17_Pr1_C, Primary (Oligodendroglioma) 4 P17_Rec1_A, Recurrence (Glioblastoma) 5 P17_Rec1_B, Recurrence (Glioblastoma) 6 P17_Rec1_C, Recurrence (Glioblastoma) 7 P17_Rec1_D, Recurrence (Glioblastoma)

Summary Genomic Evolution Pathways Clinical Data



Each box is colored according to the allele frequency of a mutation in a sample. Options above the chart enable customization.

☐ Show only selected mutations
 63 Mutations (page 1 of 7)

Columns

Samples	Gene	Protein Change	Annotation	Mutation Type	Allele Freq	Cohort	COSMIC
<div> <div>1</div> <div>2</div> <div>3</div> <div>4</div> <div>5</div> <div>6</div> <div>7</div> </div>	IDH1	R132H	<div> <div></div> <div></div> <div></div> <div></div> </div>	Missense	<div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> </div>	<div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> </div> 100%	4964
	PIK3CA	H1047R	<div> <div></div> <div></div> <div></div> <div></div> </div>	Missense	<div> <div></div> <div></div> <div></div> <div></div> </div>	<div> <div></div> <div></div> <div></div> <div></div> </div> 8%	1983
<div> <div>1</div> <div>2</div> <div>3</div> <div>4</div> <div>5</div> <div>6</div> <div>7</div> </div>	TP53	C176F	<div> <div></div> <div></div> <div></div> <div></div> </div>	Missense	<div> <div></div> <div></div> <div></div> <div></div> </div>	<div> <div></div> <div></div> <div></div> <div></div> </div> 90%	261
	TP53	S127F	<div> <div></div> <div></div> <div></div> <div></div> </div>	Missense	<div> <div></div> <div></div> <div></div> <div></div> </div>	<div> <div></div> <div></div> <div></div> <div></div> </div> 90%	65
<div> <div>1</div> <div>2</div> <div>3</div> <div>4</div> <div>5</div> <div>6</div> <div>7</div> </div>	ATRX	I1035Efs*5	<div> <div></div> <div></div> <div></div> <div></div> </div>	FS del	<div> <div></div> <div></div> <div></div> <div></div> </div>	<div> <div></div> <div></div> <div></div> <div></div> </div> 82%	<div> <div></div> <div></div> <div></div> <div></div> </div>
	ATRX	K96Rfs*2	<div> <div></div> <div></div> <div></div> <div></div> </div>	FS del	<div> <div></div> <div></div> <div></div> <div></div> </div>	<div> <div></div> <div></div> <div></div> <div></div> </div> 82%	
<div> <div>4</div> <div>5</div> <div>6</div> <div>7</div> </div>	ARNT	F427L	<div> <div></div> <div></div> <div></div> <div></div> </div>	Missense	<div> <div></div> <div></div> <div></div> <div></div> </div>	<div> <div></div> <div></div> <div></div> <div></div> </div> 11%	
	KAT6B	M1961V	<div> <div></div> <div></div> <div></div> <div></div> </div>	Missense	<div> <div></div> <div></div> <div></div> <div></div> </div>	<div> <div></div> <div></div> <div></div> <div></div> </div> 7%	
<div> <div>1</div> <div>2</div> <div>3</div> <div>4</div> <div>5</div> <div>6</div> <div>7</div> </div>	NOTCH4	C1091W	<div> <div></div> <div></div> <div></div> <div></div> </div>	Missense	<div> <div></div> <div></div> <div></div> <div></div> </div>	<div> <div></div> <div></div> <div></div> <div></div> </div> 5%	
	FAT1	A4224T	<div> <div></div> <div></div> <div></div> <div></div> </div>	Missense	<div> <div></div> <div></div> <div></div> <div></div> </div>	<div> <div></div> <div></div> <div></div> <div></div> </div> 13%	

Hover or click on a mutation in the table to see it highlighted in the chart above.

Patient View, Example 2: Clinical Data

 Patient: P17, Male, 27 years old, Glioma, **LIVING** (59 months)

Samples:  P17_Pri_A, Primary (Oligodendroglioma)  P17_Pri_B, Primary (Oligodendroglioma)  P17_Pri_C, Primary (Oligodendroglioma)  P17_Rec1_A, Recurrence (Glioblastoma)  P17_Rec1_B, Recurrence (Glioblastoma)  P17_Rec1_C, Recurrence (Glioblastoma)  P17_Rec1_D, Recurrence (Glioblastoma)

Low-Grade Gliomas (UCSF, Science 2014)

< 1 of 2 patients >

Summary Genomic Evolution Pathways **Clinical Data**

Patient

Attribute	Value
Overall Survival Status	0:LIVING
Diagnosis Age	27
Number of Samples Per Patient	7
Overall Survival (Months)	59
Sex	Male

All available patient-level clinical information

Samples

Attribute	P17_Pri_A	P17_Pri_B	P17_Pri_C	P17_Rec1_A	P17_Rec1_B	P17_Rec1_C	P17_Rec1_D
Mutation Count	16	12	12	30	37	27	39
Sample Type	Primary	Primary	Primary	Recurrence	Recurrence	Recurrence	Recurrence
1p/19q Status	Intact	Intact	Intact	Intact	Intact	Intact	Intact
Cancer Type	Glioma	Glioma	Glioma	Glioma	Glioma	Glioma	Glioma
Cancer Type Detailed	Oligodendroglioma	Oligodendroglioma	Oligodendroglioma	Glioblastoma	Glioblastoma	Glioblastoma	Glioblastoma
IDH1 Mutation	R132H	R132H	R132H	R132H	R132H	R132H	R132H
MGMT Status	Methylated	Methylated	Methylated	Unmethylated	Unmethylated	Unmethylated	Unmethylated
Neoplasm Histologic Grade	II	II	II	IV	IV	IV	IV
Non-silent mutations in TP53, ATRX, CIC, FUBP1	TP53, ATRX	TP53, ATRX	TP53, ATRX	TP53, ATRX	TP53, ATRX	TP53, ATRX	TP53, ATRX
Oncotree Code	ODG	ODG	ODG	GB	GB	GB	GB
Somatic Status	Matched	Matched	Matched	Matched			
TMB (nonsynonymous)	0.533333333333	0.4	0.4	0.966666666666			

All available sample-level information

Timeline Data

Surgery

START_DATE	STOP_DATE	EVENT_TYPE	EVENT_TYPE_DETAILED
0		Surgery	OA II biopsy
311		Surgery	Oligo II Initial
1214		Surgery	GBM Recurrence1

When available, the data used to populate the timeline in the Summary tab is shown here.

[Link to this page](#)

The screenshot displays the OncoPrint web application interface. At the top, patient information is shown: "Patient: P17, Male, 27 years old, Glioma, LIVING (59 months)". Below this, a list of samples is provided: "Samples: 1 P17_Pri_A, Primary (Oligodendroglioma) 2 P17_Pri_B, Primary (Oligodendroglioma) 3 P17_Pri_C, Primary (Oligodendroglioma) 4 P17_Rec1_A, Recurrence (Glioblastoma)". A callout box highlights the sample ID "P17_Rec1_A" and states: "Clicking on a sample ID on one of the previous pages brings up this sample-specific page."

The main content area is divided into two panels. The left panel, titled "Summary", lists various attributes and their values for the selected sample (P17_Pri_A):

Attribute	Value
Mutation Count	16
Sample Type	Primary
1p/19q Status	Intact
Cancer Type	Glioma
Cancer Type Detailed	Oligodendroglioma
IDH1 Mutation	R132H
MGMT Status	Methylated
Neoplasm Histologic Grade	II
Non-silent mutations in TP53, ATRX, CIC, FUBP1	TP53, ATRX
Oncotree Code	ODG
Somatic Status	Matched
TMB (nonsynonymous)	0.533333333333

The right panel, titled "Clinical Data", shows a timeline of the patient's clinical history. It includes a "Summary" tab and a "Clinical Data" tab. The timeline displays events such as "SPECIMEN SURGERY", "STATUS", "TREATMENT", and "Medical Therapy". A callout box indicates that clicking on a sample ID on a previous page brings up this sample-specific page.

Below the clinical data, a section titled "16 Mutations (page 1 of 2)" displays a table of genomic alterations. The table includes columns for "Samples", "Gene", "Protein Change", "Annotation", "Mutation Type", "Allele Freq", "Cohort", and "COSMIC".

Samples	Gene	Protein Change	Annotation	Mutation Type	Allele Freq	Cohort	COSMIC
1	IDH1	R132H	Missense	Missense	0.43	100%	4964
1	TP53	C176F	Missense	Missense	0.87	90%	261
1	ATRX	I1035Efs*5	FS del	FS del		82%	
1	NOTCH4	C1091W	Missense	Missense	0.12	5%	
1	CARMIL3	R858W	Missense	Missense	0.46	8%	
1	ZNF628	R167H	Missense	Missense	0.48	7%	
1	RFX7	N1327S	Missense	Missense	0.45	8%	
1	ABCA10	I998L	Missense	Missense	0.46	7%	
1	SUGCT	L69*	Nonsense	Nonsense	0.41	5%	
1	POLR1G	N218Kfs*58	FS ins	FS ins		5%	

Ok, now that we've seen what data is present in Patient View, we can start asking some fun question!

Let's look at RAS mutations in Uterine Corpus Endometrial Carcinoma (TCGA, Nature 2013).

Example 3: Run the query

[Query](#) [Quick Search **Beta!**](#) [Download](#) Please cite: [Cerami et al., 2012](#) & [Gao et al., 2013](#)

Selected Studies: [Modify](#) Uterine Corpus Endometrial Carcinoma (TCGA, Nature 2013) | (373 total samples)

Select Genomic Profiles:

- ☒ Mutations [?](#)
- ☒ Putative copy-number alterations from GISTIC [?](#)
- ☐ mRNA Expression. Select one of the profiles below:
 - ☐ mRNA expression z-scores relative to diploid samples (microarray) [?](#)
 - ☐ mRNA expression z-scores relative to all samples (log microarray) [?](#)
 - ☐ mRNA expression z-scores relative to diploid samples (RNA Seq V2 RSEM) [?](#)
 - ☐ mRNA expression z-scores relative to all samples (log RNA Seq V2 RSEM) [?](#)
- ☐ Protein expression z-scores (RPPA) [?](#)

Select Patient/Case Set:
To build your own case set,
try out our enhanced Study View.

Samples with mutation and CNA data (240) [×](#) [▼](#)

Enter Genes:

User-defined List [×](#) [▼](#)

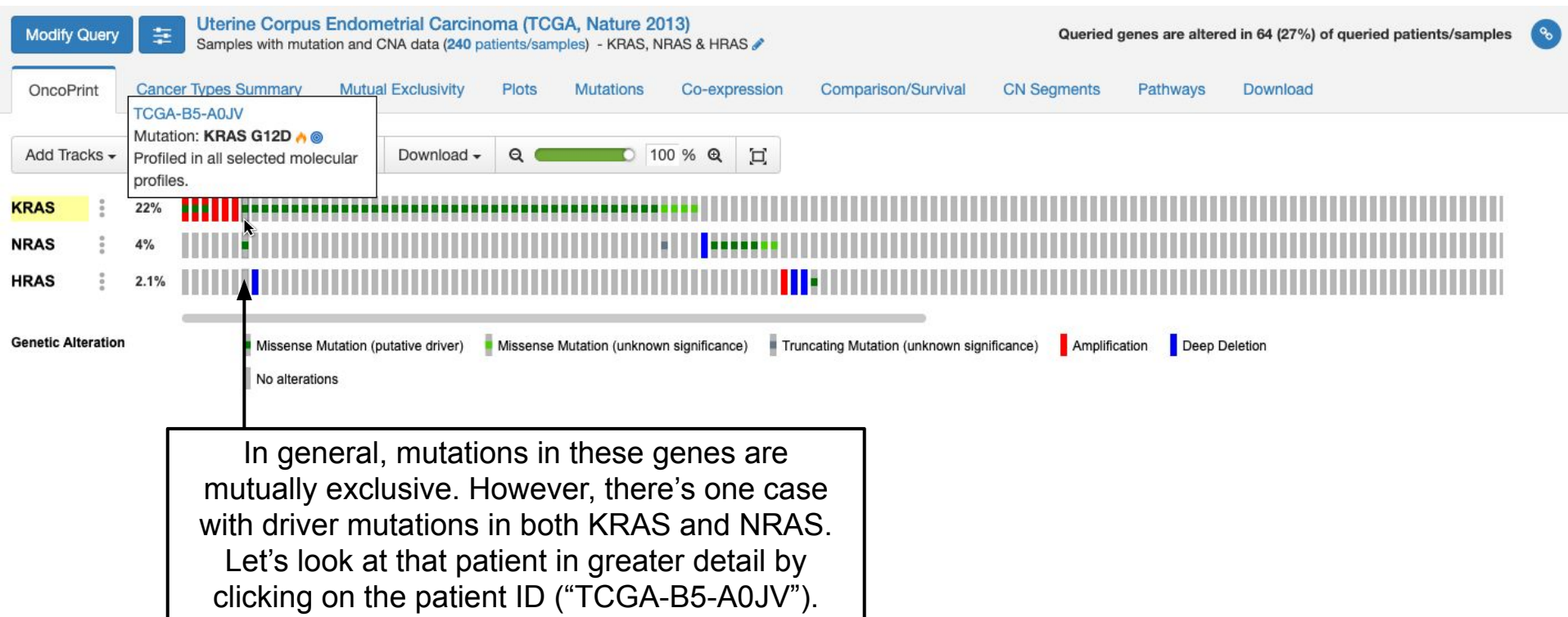
Hint: [Learn Onco Query Language \(OQL\)](#)
to write more powerful queries [↗](#)

KRAS NRAS HRAS

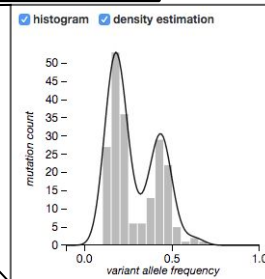
☒ All gene symbols are valid.

Submit Query

Example 3: OncoPrint



1. Look at the Allele Freq column for each mutation. NRAS Q61K (19%) and KRAS G12D (21%) have similar variant allele frequencies, but PIK3CA E542K is twice as high (38%).



3. Could this be related to differences in clonality? Perhaps the PIK3CA mutation is clonal while the NRAS & KRAS mutations are in two distinct subclones. If that theory is correct, we would expect to see other mutations with similar variant allele frequencies. Indeed, we can see that is true by looking at the histogram of variant allele frequency.

Summary of Example 3: Using Patient View, we can infer the clonality of mutations and understand how two mutations, which are usually mutually exclusive, can be present in the same tumor sample. In this case, the KRAS and NRAS mutations appear to be present in two distinct subclones of a single tumor.

Questions?

Check out our other tutorials
or email us at:

cbioportal@googlegroups.com