

cBioPortal Tutorial #1: Single Study Exploration

Explore all data in a dataset

Tutorial Objectives

- Introduce cBioPortal main page
- Show two ways to select a study
 - From the Query box on the main page
 - From the Data Sets page
- Walk through the four possible tabs in the single study view
 - Study Summary
 - Clinical Data
 - Heatmaps
 - CN Segments
- Show how to run a query from the single study view

cBioPortal Main Page

The cBioPortal for Cancer Genomics interface is shown with several annotations:

- Browse available datasets and initiate queries:** Points to the "Query" button in the top navigation bar.
- Download data:** Points to the "Download" button in the top navigation bar.
- Search studies:** Points to the "Search..." input field in the "Select Studies" section.
- Number of studies for each organ system (click to filter):** Points to the list of organ systems on the left side of the "Select Studies" section.
- List of all studies, organized by organ system:** Points to the detailed list of studies under the "PanCancer Studies" category.

The page includes a header with the cBioPortal logo and navigation links (Data Sets, Web API, R/MATLAB, Tutorials, FAQ, News, Visualize Your Data, About, Login). The main content area features a "Select Studies" section with a search bar and a list of organ systems (PanCancer Studies, Cell lines, Adrenal Gland, Ampulla of Vater, Biliary Tract, Bladder/Urinary Tract, Bone, Bowel, Breast, CNS/Brain). Each organ system has a count of studies. Below this, a "List of all studies, organized by organ system" is displayed, showing details for PanCancer Studies, Cell lines, Adrenal Gland, and Ampulla of Vater. The "Enter Genes" section at the bottom allows users to enter HUGO Gene Symbols or OQL. A "Submit Query" button is located at the bottom left. A "What's New" section on the right highlights a major new feature: Group Comparison. A "Cancer Studies" section on the right shows a bar chart of cases by top 20 primary sites.

What's New @cbioportal

cBioPortal @cbioportal

We are happy to announce a major new feature: Group Comparison. You can now compare clinical and genomic features of user-defined groups of samples or patients. The feature is available on the Study View. Tutorial: cbioportal.org/tutorials/#group-comparison

Sign up for low-volume email news alerts

Subscribe

Cancer Studies

The portal contains 250 cancer studies (details)

Cases by Top 20 Primary Sites

Primary Site	Cases
Breast	10945
Lung	1144
Lymphoid	92
CNS/Brain	92
Prostate	92
Kidney	92
Bowel	92
Stomach	92
Bladder	92
Head/Neck	92
Uterus	92
Ovary	92
Myeloid	92
Thyroid	92
Skin	92
Liver	92
PNS	92
Pancreas	92
Soft Tissue	92

Selecting a study: from Query

3. Or click on “Data Sets” to browse Data Sets page

1. Start typing tumor type of interest...

2. Click on “View study summary” button

The screenshot shows the cBioPortal interface for selecting studies. The search bar at the top right contains the text 'glioma'. Below the search bar, the 'Select Studies' section displays a list of studies under the filter 'CNS/Brain'. The studies listed include 'Diffuse Glioma' (14 studies) and 'Glioblastoma' (14 studies). A button labeled 'View clinical and genomic data of this study' is highlighted with a red box. Below the study list, the 'Enter Genes' section is visible, with a text input field for 'User-defined List' and a 'Submit Query' button at the bottom.

Search Results:

- glioma

Select Studies: 0 studies selected (0 samples)

CNS/Brain

- Diffuse Glioma
 - ☐ Brain Lower Grade Glioma (TCGA, PanCancer Atlas)
 - ☐ Brain Lower Grade Glioma (TCGA, Provisional)
 - ☐ Glioma (MSK, 2018)
 - ☐ Low-Grade Gliomas (UCSF, Science 2014)
 - ☐ Merged Cohort of LGG and GBM (TCGA, Cell 2016)
- **GLIOBLASTOMA**
 - ☐ Glioblastoma (TCGA, Cell 2013)
 - ☐ Glioblastoma (TCGA, Nature 2008)
 - ☐ Glioblastoma Multiforme (TCGA, PanCancer Atlas)
 - ☐ Glioblastoma Multiforme (TCGA, Provisional)
- **OLIGODENDROGLIOMA**
 - ☐ Anaplastic Oligodendroglioma and Anaplastic Oligo...

View clinical and genomic data of this study

530 samples
91 samples
61 samples
1122 samples
535 samples
206 samples
592 samples
604 samples
22 samples

Enter Genes:

User-defined List

Hint: Learn Onco Query Language (OQL) to write more powerful queries

Enter HUGO Gene Symbols, Gene Aliases, or OQL

Submit Query

Please select one or more cancer studies.

Selecting a study: from Data Sets page

1. Use search functionality to find datasets of interest

2. Or sort by number of samples with each data types

cbioportal
FOR CANCER GENOMICS

[Data Sets](#) [Web API](#) [R/MATLAB](#) [Tutorials](#) [FAQ](#) [News](#) [Visualize Your Data](#) [About](#)

Datasets

The table below lists the number of available samples per cancer study and data type.

Columns ▾

Name ▲	Reference	All	Sequenced	CNA	RNA-Seq
Acinar Cell Carcinoma of the Pancreas (JHU, J Pathol 2014)	Jial et al. J Pathol 2014	23	23	0	0
Acral Melanoma (TCGA, Genome Res 2017)	Liang et al. Genome Res 2017	38	38	38	36
Acute Lymphoblastic Leukemia (St Jude, Nat Genet 2015)	Andersson et al. Nat Genet 2015	93	83	0	0
Acute Lymphoblastic Leukemia (St Jude, Nat Genet 2016)	Zhang et al. Nat Genet 2016	73	73	0	0
Acute Myeloid Leukemia (TCGA, NEJM 2013)	TCGA, NEJM 2013	200	200	191	173
Acute Myeloid Leukemia (TCGA, PanCancer Atlas)	TCGA, Cell 2018	200	200	191	173
Acute Myeloid Leukemia (TCGA, Provisional)		200	197	191	173
Adenoid Cystic Carcinoma (FMI, Am J Surg Pathol. 2014)	Ross et al. Am J Surg Pathol 2014	28	28	28	0
Adenoid Cystic Carcinoma (JHU, Cancer Prev Res 2016)	Rettig et al. Cancer Prev Res 2016	25	25	0	0
Adenoid Cystic Carcinoma (MDA, Clin Cancer Res 2015)	Mitani et al. Clin Cancer Res 2015	102	65	0	0
Adenoid Cystic Carcinoma (MGH, Nat Gen 2016)	Drier et al. Nature Genetics 2016	10	10	0	0
Adenoid Cystic Carcinoma (MSKCC, Nat Genet 2013)	Ho et al. Nat Genet 2013	60	60	60	0
Adenoid Cystic Carcinoma (Sanger/MDA, JCI 2013)	Stephens et al. JCI 2013	24	24	0	0
Adenoid Cystic Carcinoma of the Breast (MSKCC, J Pathol. 2015)	Martelotto et al. J Pathol 2015	12	12	12	0
Adrenocortical Carcinoma (TCGA, PanCancer Atlas)	TCGA, Cell 2018	92	91	89	78
Adrenocortical Carcinoma (TCGA, Provisional)		92	90	90	79
Adult Soft Tissue Sarcomas (TCGA, Cell 2017)	TCGA, Cell 2017	206	206	206	206
Ampullary Carcinoma (Baylor College of Medicine, Cell Reports 2016)	Gingras et al. Cell Rep 2016	160	160	0	0
Anaplastic Oligodendroglioma and Anaplastic Oligoastrocytoma (MSKCC, Neuro Oncol 2017)	Thomas et al. Neuro Oncol 2017	22	22	22	0
Bladder Cancer (MSKCC, Eur Urol 2014)	Kim et al. Eur Urol 2015	109	109	109	0
Bladder Cancer (MSKCC, J Clin Onco 2013)	Iyer et al. J Clin Onco 2013	97	97	97	0
Bladder Cancer (MSKCC, Nat Genet 2016)	Al-Ahmadie et al. Nat Genet 2016	34	34	33	0
Bladder Cancer (TCGA, Cell 2017)		413	412	408	408
Bladder Urothelial Carcinoma (BGI, Nat Genet 2013)	Guo et al. Nat Genet 2013	99	99	0	0
Bladder Urothelial Carcinoma (DFCI/MSKCC, Cancer Discov 2014)	Van Allen et al. Cancer Discov 2014	50	50	0	0
Bladder Urothelial Carcinoma (TCGA, Nature 2014)	TCGA, Nature 2014	131	130	128	129
Bladder Urothelial Carcinoma (TCGA, PanCancer Atlas)		411	410	408	407
Bladder Urothelial Carcinoma (TCGA, Provisional)		413	238	408	408
Brain Lower Grade Glioma (TCGA, PanCancer Atlas)		514	512	511	514
Brain Lower Grade Glioma (TCGA, Provisional)		530	286	513	530
Breast Cancer (METABRIC, Nature 2012 & Nat Commun 2016)	Perera et al. Nat Commun 2016	2509	2509	2173	1904
Breast Cancer (MSK, Cancer Cell 2018)	Razavi et al. Cancer Cell 2018	1918	1918	1918	0

3. Click on data set of interest

Once you select a study by either method you land on the Study Summary Tab.

Here you can explore features (e.g. mutated genes or gender) of the samples in the study (or of a subset of samples in the study) or initiate a query.

The features available to explore will depend on the data available for the particular study selected.

Study Summary Tab: Overview

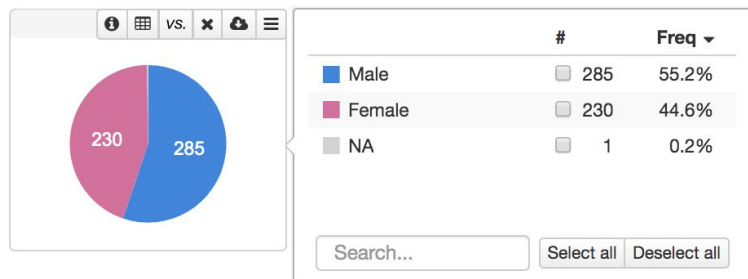
Number of
samples/patients







Interactive charts: these
can be used to select a
subset of the samples.
All charts will then
update to reflect the
features of that subset.



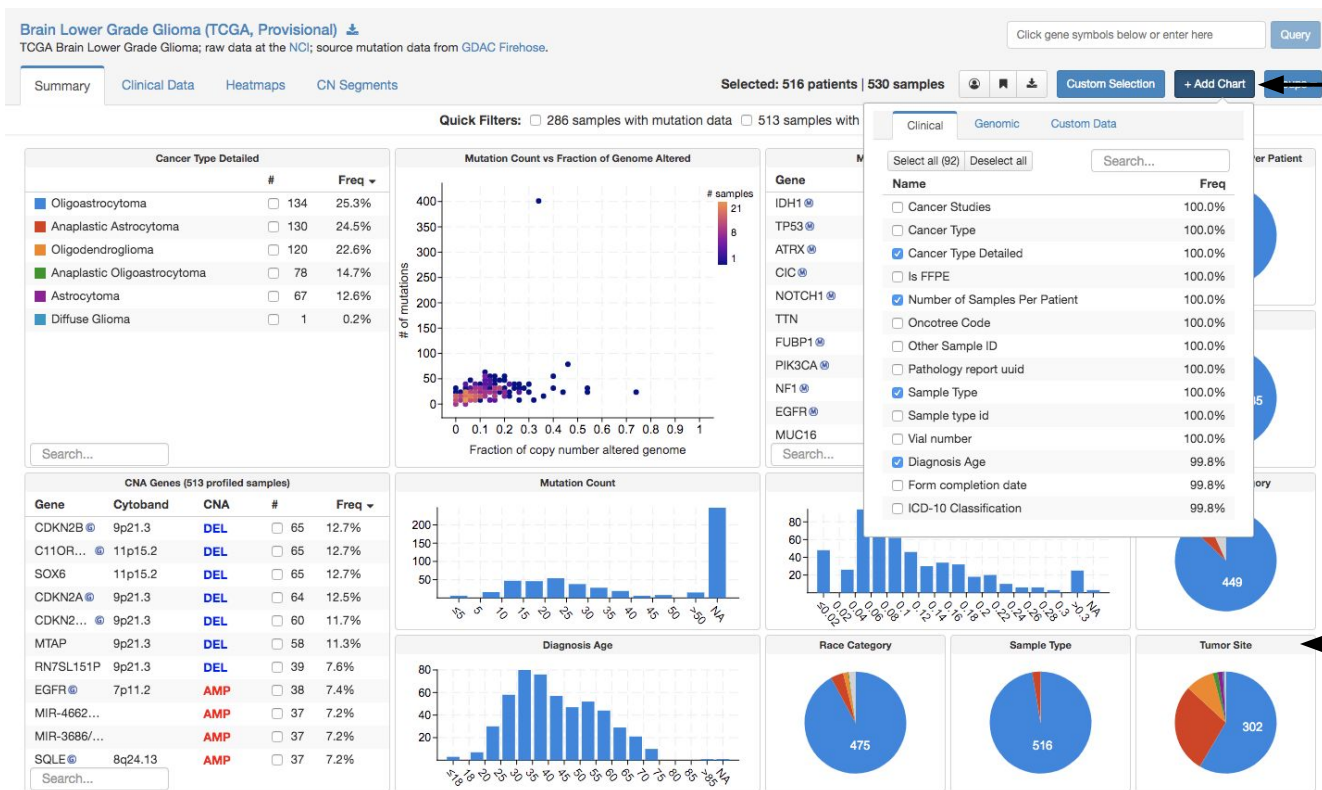
Study Summary Tab: Charts

Hover over a chart to find these buttons



-  Hover for a description of the data in this chart.
-  Click to convert the pie chart to a table. Hovering over the chart will also bring up a tooltip with tabular data.
-  Click to go to a group comparison session with groups based on these values. See the [group comparison tutorial](#) for more details.
-  Click to remove this chart from view.
-  Click to download data (text file) or plot (PDF or SVG).
-  Hover to bring up a menu with the same options.

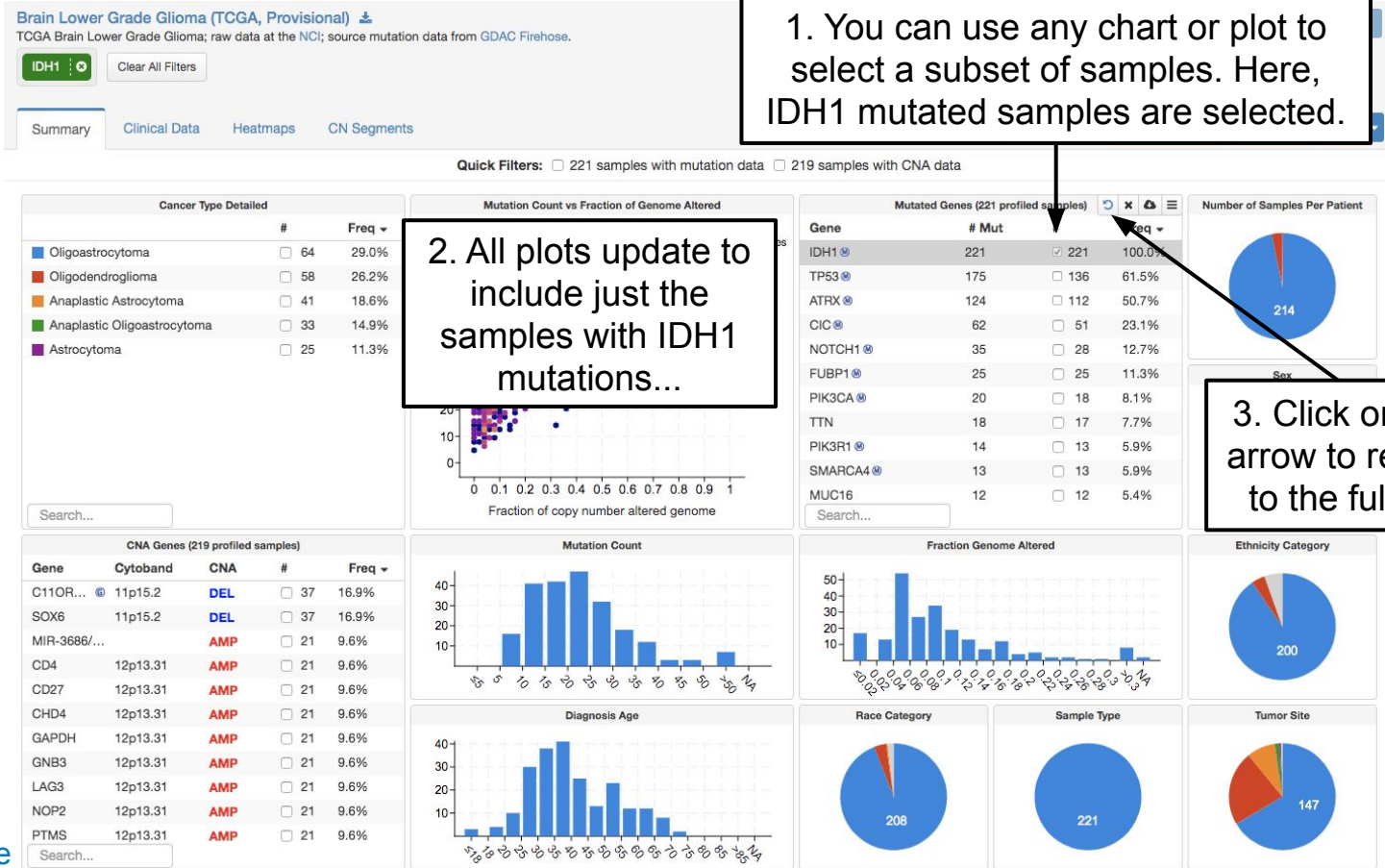
Study Summary Tab: Charts



Many studies have additional charts that can be added using this button.

Charts can always be reordered by dragging on the grey bar with the chart name.

Study Summary Tab: Selecting subsets of data



Clinical Data Tab

Brain Lower Grade Glioma (TCGA, Provisional) [TCGA Brain Lower Grade Glioma; raw data at the NCI; source mutation data from GDAC Firehose.](#)

IDH1 [Clear All Filters](#)

Summary Clinical Data Heatmaps

Selected: 221 patients | 221 samples [Custom Selection](#) [+ Add Column](#) [Groups](#)

Filters applied in the Summary tab apply to this table

Download clinical data table

Show additional data (available data will vary based on the study)

Patient ID	Sample ID	Cancer Type Detailed	Number of Samples Per Patient	Mutation Count	Fraction Genome Altered	Diagnosis Age	Sex	Ethnicity Category	Race Category	Sample Type	Tumor Site	Adjuvant Postoperative Targeted Therapy Administered Indicator	Age of Food Allergy	Animal Insect Allergy Age	Animal Insect Allergy History	Asthma History	...
TCGA-CS-4938	TCGA-CS-4938-01	Astrocytoma	1	14	0.0518	31	Female	NOT HISPANIC OR LATINO	WHITE	Primary	Supratentorial, Frontal Lobe			12 - 20 Years	YES	NO	-
TCGA-CS-4942	TCGA-CS-4942-01	Anaplastic Astrocytoma	1	19	0.0937	44	Female		BLACK OR AFRICAN AMERICAN	Primary	Supratentorial, Frontal Lobe				NO	NO	-
TCGA-CS-4943	TCGA-CS-4943-01	Anaplastic Astrocytoma	1	21	0.1625	37	Male		WHITE	Primary	Supratentorial, Frontal Lobe						5
TCGA-CS-4944	TCGA-CS-4944-01	Astrocytoma	1	19	0.0603	50	Male		WHITE	Primary	Supratentorial, Temporal Lobe						-
TCGA-CS-5390	TCGA-CS-5390-01	Oligodendroglioma	1	30	0.0511	47	Female		WHITE	Primary	Supratentorial, Parietal Lobe						
TCGA-CS-5391	TCGA-CS-5391-01	Anaplastic Astrocytoma	1	21	0.0569	39	Male		WHITE	Primary	Supratentorial, Temporal Lobe						

Scroll to the right to see more columns. Each column can be sorted by clicking on the column header.

Heatmaps Tab

This tab will only appear for some TCGA studies. It is an embedding of the [Next-Generation Clustered Heat Map](#) interactive heatmap tool.

Brain Lower Grade Glioma (TCGA, Provisional) 
TCGA Brain Lower Grade Glioma; raw data at the NCI; source mutation data from GDAC Firehose.

IDH1 

Clear All Filters

below or enter here

Query

Summary

Clinical Data

Heatmaps

CN Segments

Selected: 221 patients | 221 samples



Groups ▾

THE UNIVERSITY OF TEXAS
MDAnderson
Cancer Center

TCGA Next-Generation Clustered Heat Map (NG-CHM) Compendium

Single Study Maps

Choose one or more criteria:

Cancer Type
LGG - Brain Lower Grade Glioma ▾

Platform
Select platform ▾

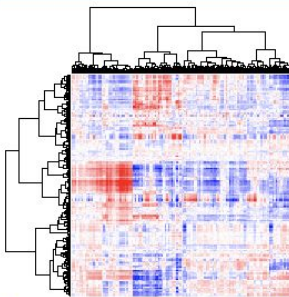
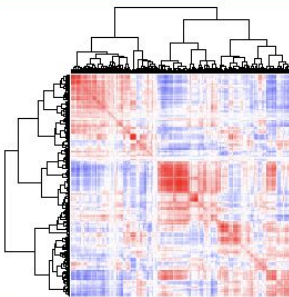
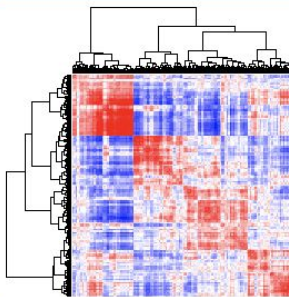
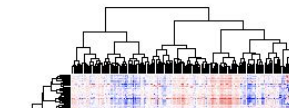
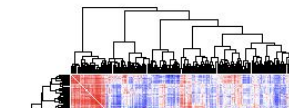
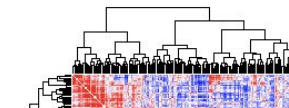
Heatmap Type
Select heat map type ▾

[See other Heat Map Collections](#)

[Bookmark Link for Current View](#)

NG-CHM Viewer Help
[Quick User Guide \(Video\)](#)

Click on any thumbnail image shown below to open in the NG-CHM viewer.

	Gene/Probe vs Sample	Gene/Probe vs Gene/Probe	Sample vs Sample
mRNA Expression	 tcga_rnaseqv2_lgg_v2.0_gene_sample	 tcga_rnaseqv2_lgg_v2.0_gene_gene	 tcga_rnaseqv2_lgg_v2.0_sample_sample
			

[Link to this page](#)

CN Segments Tab



When copy number data is available, this tab integrates the [Integrated Genomics Viewer](#) (IGV) to allow browsing of copy number data across the entire genome. Each row is a single sample.

Study Summary Tab: Additional Features

Brain Lower Grade Glioma (TCGA, Provisional) 

TCGA Brain Lower Grade Glioma; raw data at the NCI; source mutation data from GDAC Firehose.

Summary

Clinical Data

Heatmaps

CN Segments

Selected: 516 patients | 530 samples



Custom Selection

+ Add Chart

Groups ▾

Use this box to run a query (see next slide).

Click gene symbols below or enter here

Query

Click here to see all selected samples/patients in Patient View.
See [tutorial](#).

Click here to create a virtual study of the selected samples/patients.
See [tutorial](#).

Click here to enter a list of sample or patient IDs for a custom filter.

Click here for group comparison.
See [tutorial](#).

Study Summary Tab: Run a query

3. Then click here to run the query

Brain Lower Grade Glioma (TCGA, Provisional) [📄](#)
TCGA Brain Lower Grade Glioma; raw data at the NCI; source mutation data from GDAC Firehose.

Summary Clinical Data Heatmaps CN Segments

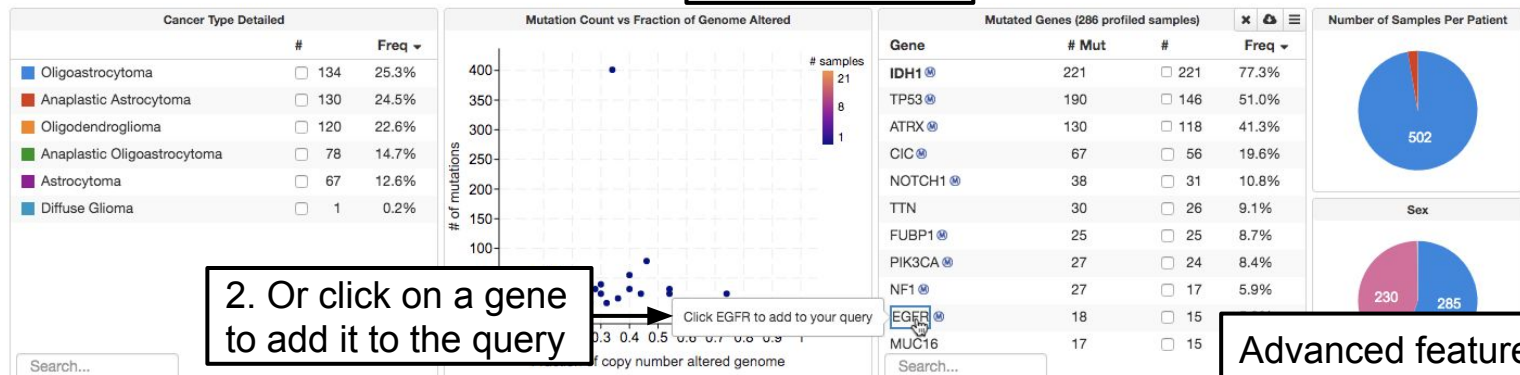
Quick Filters: ☐ 286 samples with CNA data

1. Type a gene name here

IDH1 Query

530 samples

Custom Selection + Add Chart Groups



Advanced feature:
Select a subset of the data (samples with IDH1 mutations or females or ...) before running the query. The query will then run in only those selected samples.

See Tutorial #2: Single Study Query

Questions?

Check out our other tutorials
or email us at:

cbioportal@googlegroups.com