

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 screenshot shows the cBioPortal main page with several annotations:

- Search studies**: Points to the search bar at the top right.
- Browse available datasets and select studies to explore or query**: Points to the "Query" tab at the top left.
- Number of studies for each tissue of origin (click to filter)**: Points to the list of tissues on the left side.
- List of all studies, organized by organ system**: Points to the "PanCancer Studies" section in the main content area.

The page layout includes a header with the cBioPortal logo and navigation links (Data Sets, Web API, R/MATLAB, Tutorials, FAQ, News, Visualize Your Data, About). The main content area is divided into a left sidebar for tissue filtering, a central section for selecting studies, and a right sidebar with "What's New" and "Cancer Studies" information.

Left Sidebar (Tissues):

Tissue	Number of Studies
PanCancer Studies	3
Cell lines	2
Adrenal Gland	3
Ampulla of Vater	1
Biliary Tract	8
Bladder/Urinary Tract	13
Bone	2
Bowel	9
Breast	16
CNS/Brain	18
Cervix	2
Esophagus/Stomach	14
Eye	3
Head and Neck	13

Central Section (PanCancer Studies):

Select Studies for Visualization & Analysis: 0 studies selected (0 samples)

Quick select: TCGA PanCancer Atlas Studies | Curated set of non-redundant studies

PanCancer Studies

- ☐ MSK-IMPACT Clinical Sequencing Cohort (MSKCC, Nat Med 2017) 10945 samples
- ☐ Pan-Lung Cancer (TCGA, Nat Genet 2016) 1144 samples
- ☐ Pediatric Pan-cancer (Columbia U, Genome Med 2016) 103 samples

Cell lines

- ☐ Cancer Cell Line Encyclopedia (Novartis/Broad, Nature 2012)
- ☐ NCI-60 Cell Lines (NCI, Cancer Res 2012)

Adrenal Gland

Adrenocortical Carcinoma

- ☐ Adenoid Cystic Carcinoma Project (2019) 1049 samples
- ☐ Adrenocortical Carcinoma (TCGA, PanCancer Atlas) 92 samples
- ☐ Adrenocortical Carcinoma (TCGA, Provisional) 92 samples

Ampulla of Vater

Ampullary Carcinoma

- ☐ Ampullary Carcinoma (Baylor College of Medicine, Cell Reports 2016) 160 samples

Biliary Tract

Right Sidebar (What's New):

cBioPortal @cbioportal

Thank you to all students and mentors who helped make @gsoc Google Summer of Code 2019 a success! We had 6 projects ranging from visualization prototypes (#clonevolution #pathwaymapper @OncoKB), to data import pipelines (#CPTAC #GDC) and backend optimizations (#spark #parquet).

Sign up for low-volume email news alerts

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Cancer Studies

The portal contains 266 cancer studies (details)

Cases by Top 20 Primary Sites

Primary Site	Number of Cases
Breast	1049
Lung	92
Lymphoid	92
CNS/Brain	18
Prostate	14
Bowel	9
Kidney	2
Stomach	3
Myeloid	13
Bladder	3
Head/Neck	13
Skin	3
Uterus	3

Bottom Navigation:

0 studies selected (0 samples) | Query By Gene | OR | Explore Selected Studies

Selecting a study: from Query

The screenshot displays the cBioPortal interface for selecting studies. The top navigation bar includes links for Data Sets, Web API, R/MATLAB, Tutorials, FAQ, News, Visualize Your Data, and About. A search bar at the top right contains the text "glioma".

1. Filter the list of studies (optional)

The search results show a list of studies under the heading "Select Studies for Visualization & Analysis:". The filter "glioma" is applied, resulting in 1 study selected (530 samples). The list includes studies such as "Brain Lower Grade Glioma (TCGA, PanCancer Atlas)" and "Brain Lower Grade Glioma (TCGA, Provisional)".

2. Select the checkbox next to the study of interest and click "Explore Selected Studies"

The checkbox next to "Brain Lower Grade Glioma (TCGA, Provisional)" is selected. The "Explore Selected Studies" button is highlighted at the bottom right.

3. Or click on "View study summary" button

The "View study summary" button is highlighted on the right side of the interface.

What's New

cBioPortal @cbioportal

Thank you to all students and mentors who helped make @gsoc Google Summer of Code 2019 a success! We had 6 projects ranging from visualization prototypes (#clonevolution) #pathwaymapping pipelines (#CPT optimizations) (#CPT optimizations)

Sign up for

Cancer Studies

The portal contains 266 cancer studies (details)

Cases by Top 20 Primary Sites

Primary Site	Cases
Breast	514
Lung	530
Lymphoid	91
CNS/Brain	61
Prostate	1102
Bowel	95
Kidney	585
Stomach	206
Myeloid	592
Bladder	604
Head/Neck	22
Skin	96
Uterus	

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 type

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)	Jia et al. J Pathol 2014	23	23	0	0
Acril 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

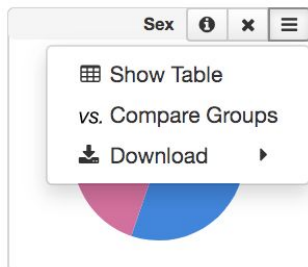
Number of
samples/patients

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 remove this chart from view.

 Hover over this button to bring up a menu with the options below:

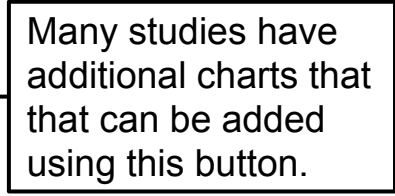
 Click to convert the pie chart to a table. Note that hovering over the chart will also bring up a tooltip with tabular data.

vs. Click to go to a group comparison session with groups based on these values. See the [group comparison tutorial](#) for more details.

 Click to download data (text file) or plot (PDF or SVG).

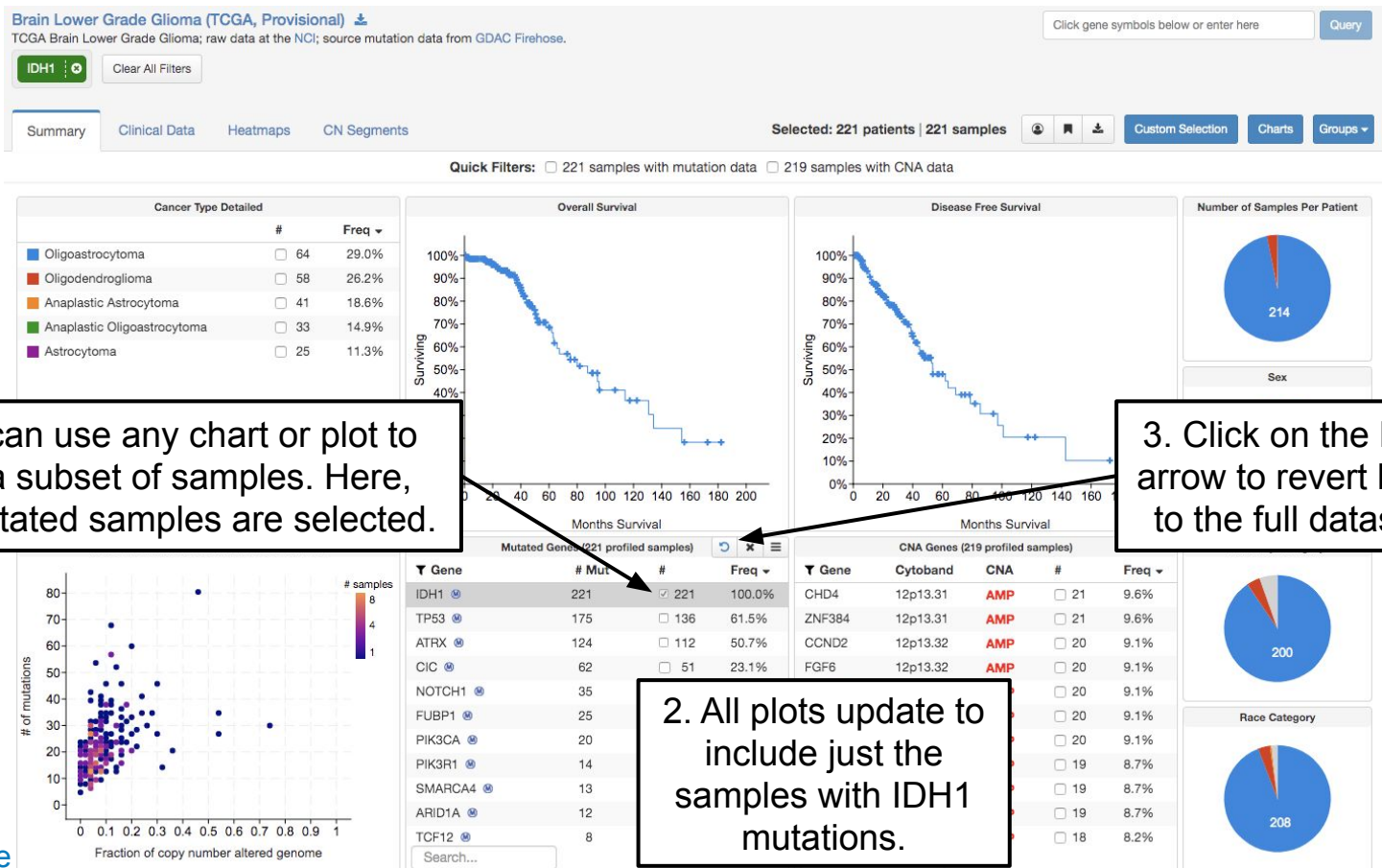
Brain Lower Grade Glioma (TCGA, Provisional)

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



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) [Download](#)
 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](#) [Columns](#) [Groups](#)

[Download clinical data table](#)

[Show additional data \(available data will vary based on the study\)](#)

Filters applied in the Summary tab apply to this table

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	Cir p s
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-	TCGA-CS-	Anaplastic Astrocytoma	1	21	0.0569	39	Male		WHITE	Primary	Supratentorial, Temporal						

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) [Download](#)
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 ▾

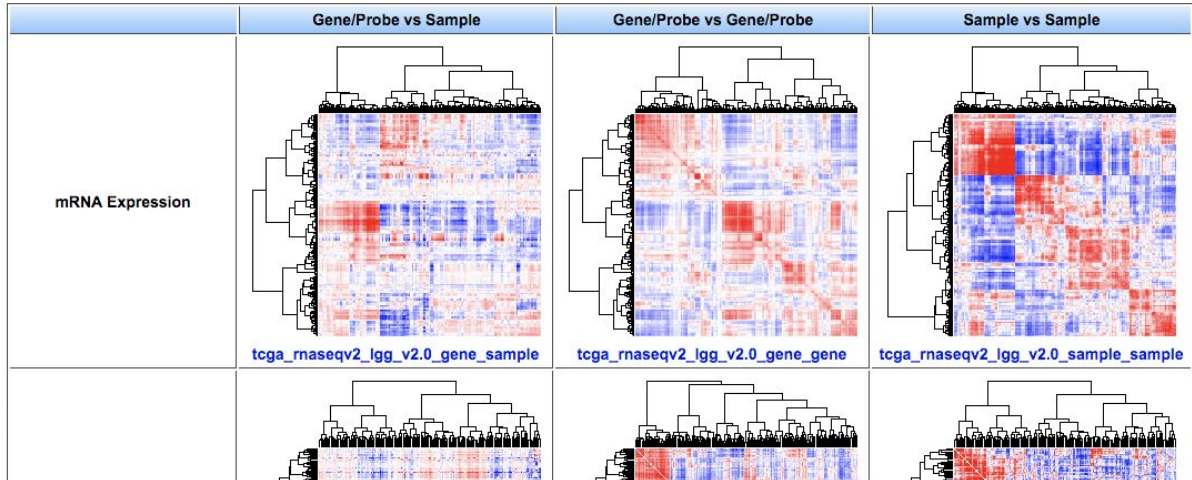
[See other Heat Map Collections](#)

[Bookmark Link for Current View](#)

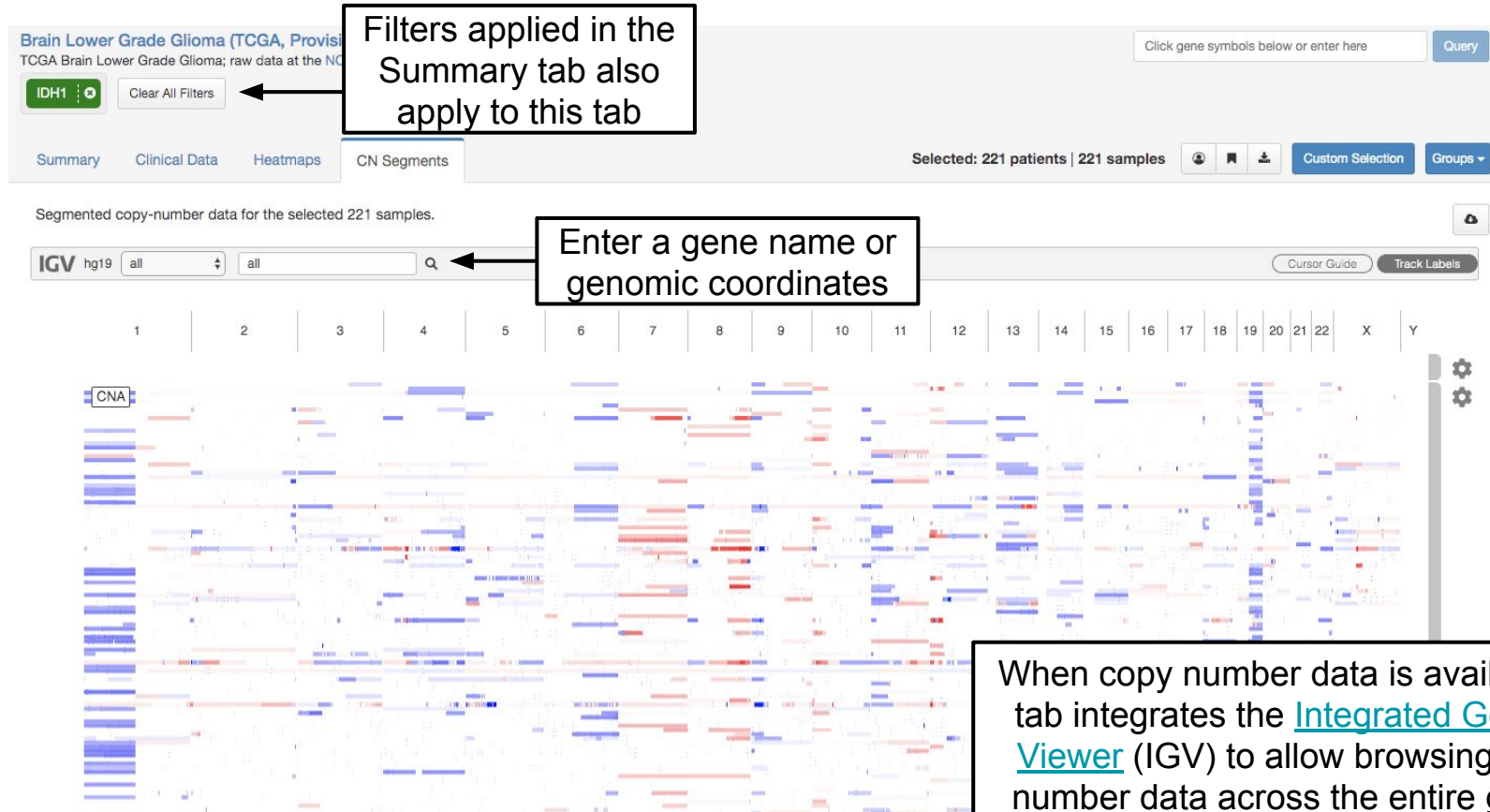
NG-CHM Viewer Help

[Quick User Guide \(Video\)](#)

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



CN Segments Tab



Study Summary Tab: Additional Features

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

Brain Lower Grade Glioma (TCGA, Provisional) [Download](#)
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

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.

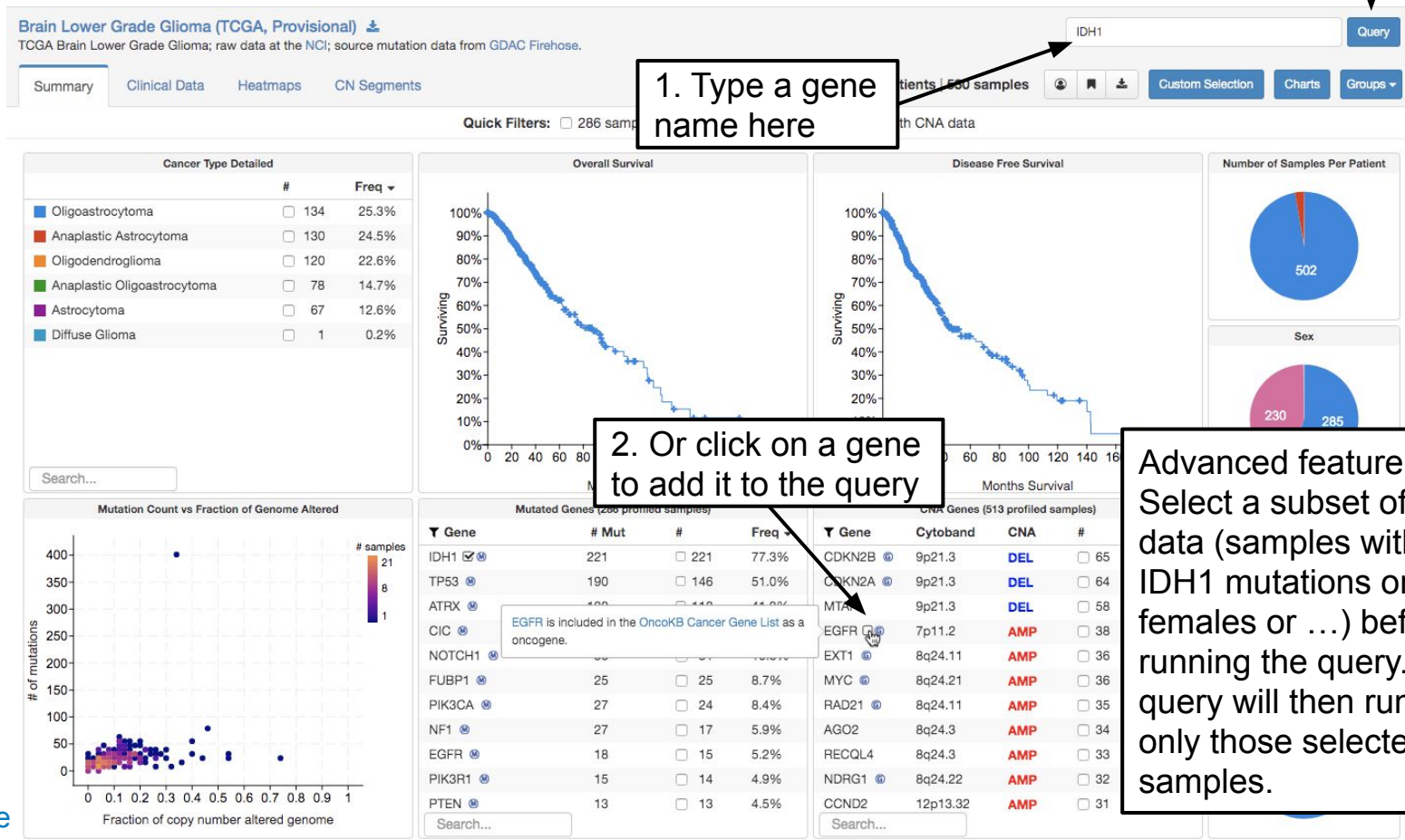
Click here for group comparison. See [tutorial](#).

Custom Selection Charts Groups

Link to this page

Study Summary Tab: Run a query

3. Then click here to run the query



See Tutorial #2: Single Study Query

Questions?

Check out our other tutorials
or email us at:

cbioportal@googlegroups.com