# The Stanford-TCGA Portal:

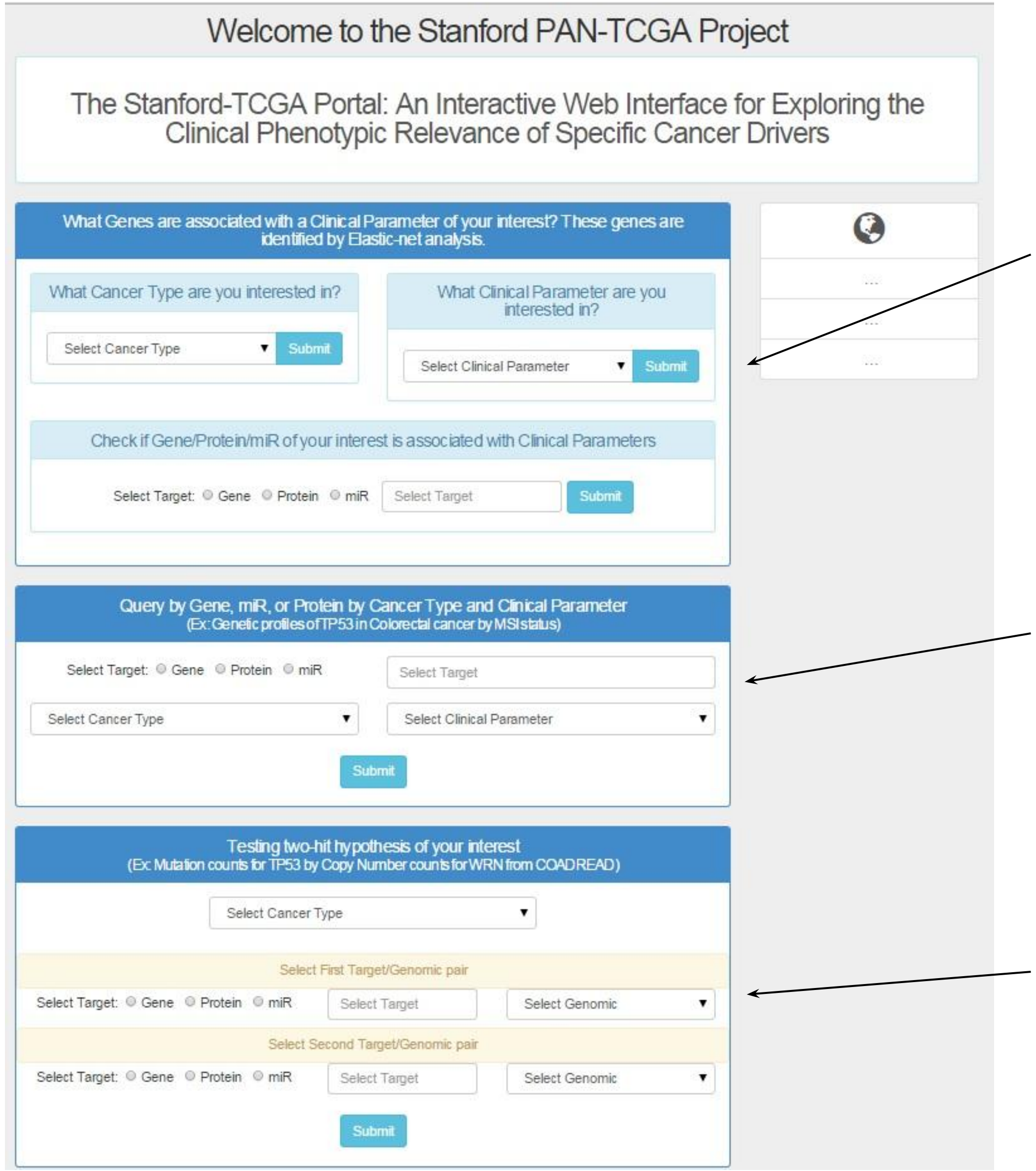
## An Interactive Web Interface for Exploring the Clinical Phenotypic Relevance of Specific Cancer Drivers

## Tutorial: How to navigate web portal

1891

STANFORD
UNIVERSITY

# Three ways of looking TCGA data



Welcome to the Stanford PAN-TCGA Project

The Stanford-TCGA Portal: An Interactive Web Interface for Exploring the Clinical Phenotypic Relevance of Specific Cancer Drivers

What Genes are associated with a Clinical Parameter of your interest? These genes are identified by Elastic-net analysis.

What Cancer Type are you interested in?

What Clinical Parameter are you interested in?

Check if Gene/Protein/miR of your interest is associated with Clinical Parameters

Query by Gene, miR, or Protein by Cancer Type and Clinical Parameter
(Ex: Genetic profiles of TP53 in Colorectal cancer by MSI status)

Testing two-hit hypothesis of your interest
(Ex: Mutation counts for TP53 by Copy Number counts for WRN from COADREAD)

Select First Target/Genomic pair

Select Second Target/Genomic pair

What are the clinically relevant genes/miRs/proteins?

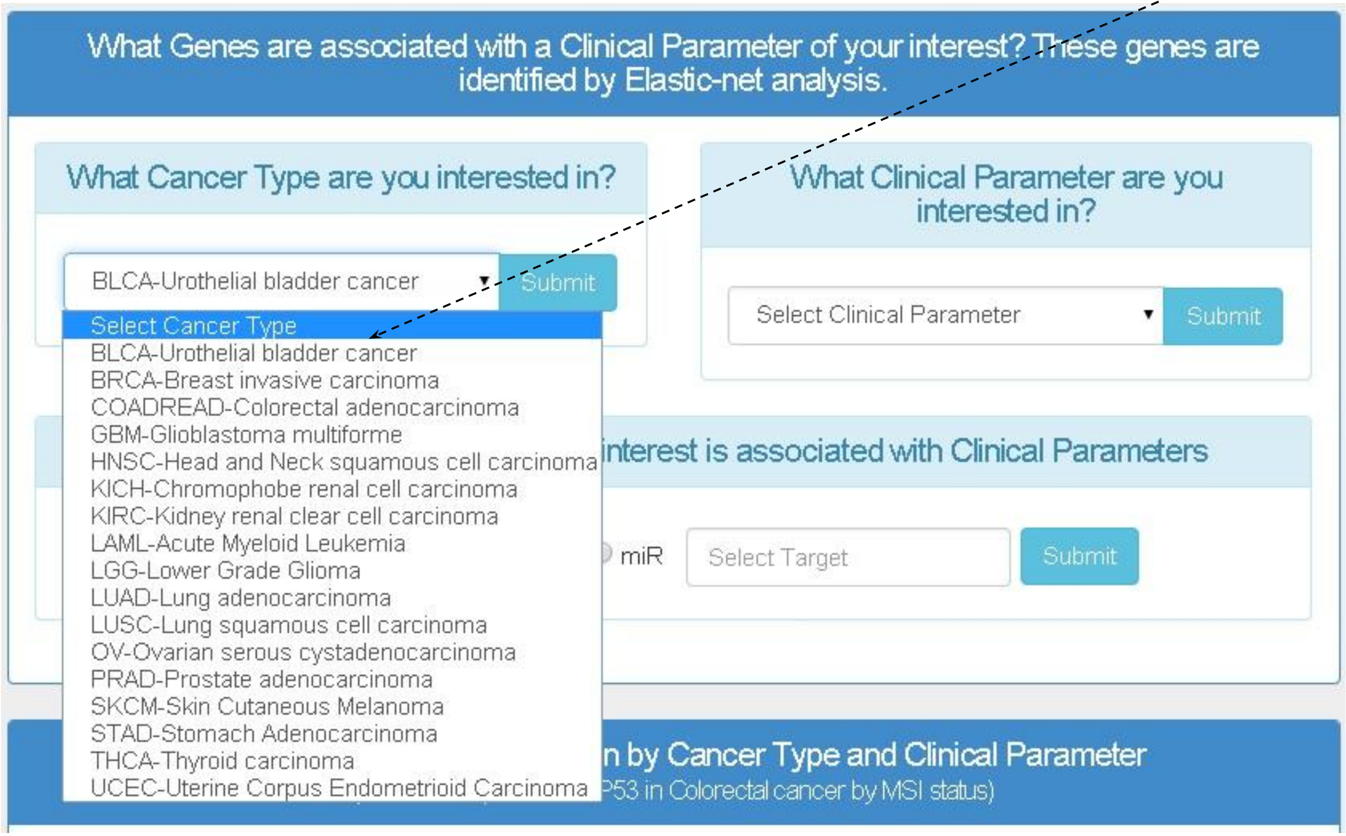
- By cancer type
- By clinical parameters
- By name of genes, miRs or proteins

Profiling by clinical parameters
: What is difference in genetic/proteomic changes between classes in a clinical parameter in a certain cancer?

Testing two hit hypothesis
: Do the changes of two genes occur together or not?

# What are the clinically relevant genes/miRs/proteins?

When you are interested in a certain cancer type, click here and select a cancer type



What Genes are associated with a Clinical Parameter of your interest? These genes are identified by Elastic-net analysis.

What Cancer Type are you interested in?

BLCA-Urothelial bladder cancer ▾ Submit

- Select Cancer Type
- BLCA-Urothelial bladder cancer
- BRCA-Breast invasive carcinoma
- COADREAD-Colorectal adenocarcinoma
- GBM-Glioblastoma multiforme
- HNSC-Head and Neck squamous cell carcinoma
- KICH-Chromophobe renal cell carcinoma
- KIRC-Kidney renal clear cell carcinoma
- LAML-Acute Myeloid Leukemia
- LGG-Lower Grade Glioma
- LUAD-Lung adenocarcinoma
- LUSC-Lung squamous cell carcinoma
- OV-Ovarian serous cystadenocarcinoma
- PRAD-Prostate adenocarcinoma
- SKCM-Skin Cutaneous Melanoma
- STAD-Stomach Adenocarcinoma
- THCA-Thyroid carcinoma
- UCEC-Uterine Corpus Endometrioid Carcinoma

What Clinical Parameter are you interested in?

Select Clinical Parameter ▾ Submit

interest is associated with Clinical Parameters

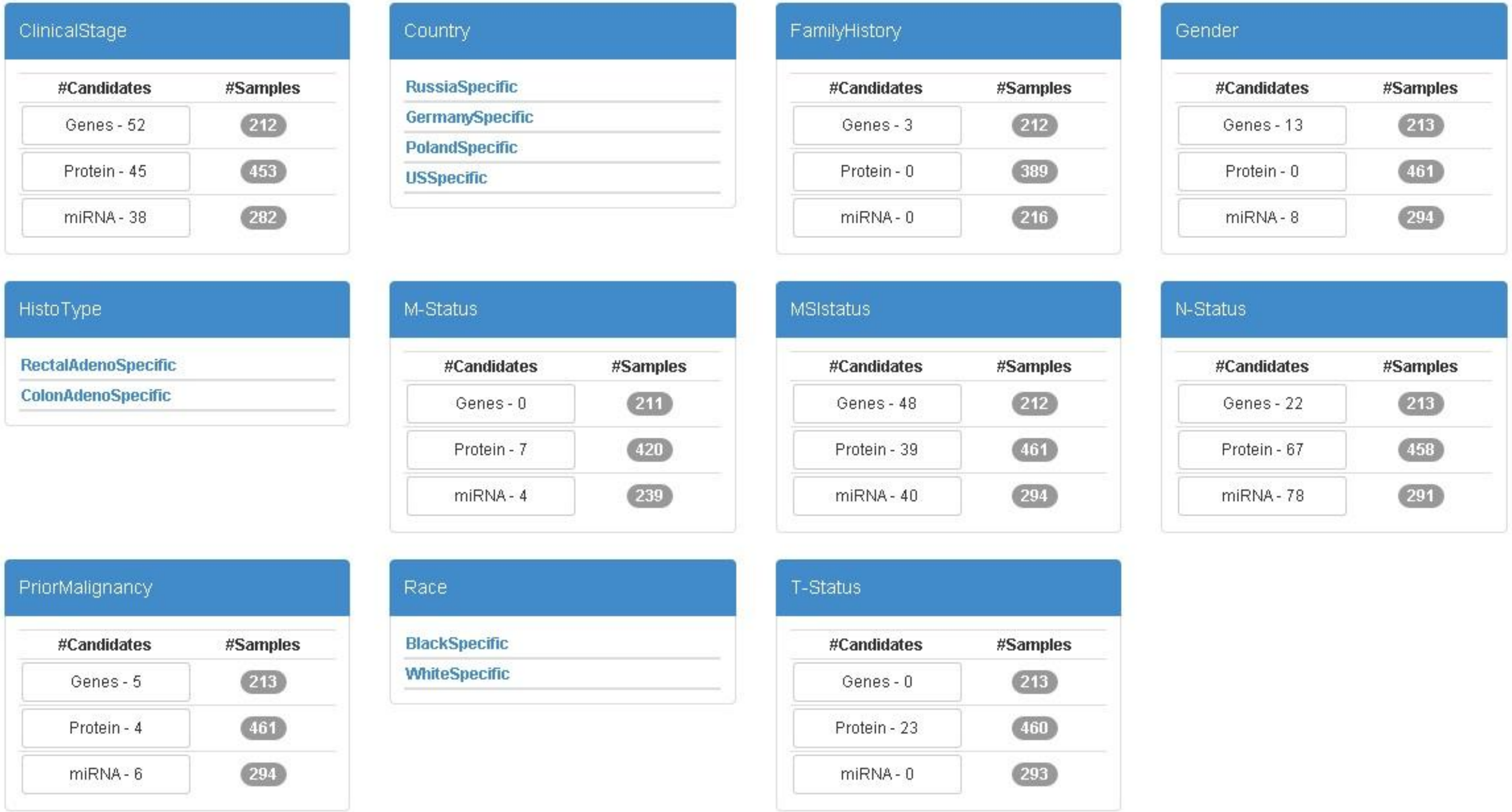
○ miR Select Target Submit

n by Cancer Type and Clinical Parameter

P53 in Colorectal cancer by MSI status)

# What are the clinically relevant genes/miRs/proteins?

If you select COADREAD, webpage shows the summary list with clinical parameters that are available in COADREAD



ClinicalStage

| #Candidates | #Samples |
|---|---|
| Genes - 52 | 212 |
| Protein - 45 | 453 |
| miRNA - 38 | 282 |

Country

- RussiaSpecific
- GermanySpecific
- PolandSpecific
- USSpecific

FamilyHistory

| #Candidates | #Samples |
|---|---|
| Genes - 3 | 212 |
| Protein - 0 | 389 |
| miRNA - 0 | 216 |

Gender

| #Candidates | #Samples |
|---|---|
| Genes - 13 | 213 |
| Protein - 0 | 461 |
| miRNA - 8 | 294 |

HistoType

- RectalAdenoSpecific
- ColonAdenoSpecific

M-Status

| #Candidates | #Samples |
|---|---|
| Genes - 0 | 211 |
| Protein - 7 | 420 |
| miRNA - 4 | 239 |

MSIstatus

| #Candidates | #Samples |
|---|---|
| Genes - 48 | 212 |
| Protein - 39 | 461 |
| miRNA - 40 | 294 |

N-Status

| #Candidates | #Samples |
|---|---|
| Genes - 22 | 213 |
| Protein - 67 | 458 |
| miRNA - 78 | 291 |

PriorMalignancy

| #Candidates | #Samples |
|---|---|
| Genes - 5 | 213 |
| Protein - 4 | 461 |
| miRNA - 6 | 294 |

Race

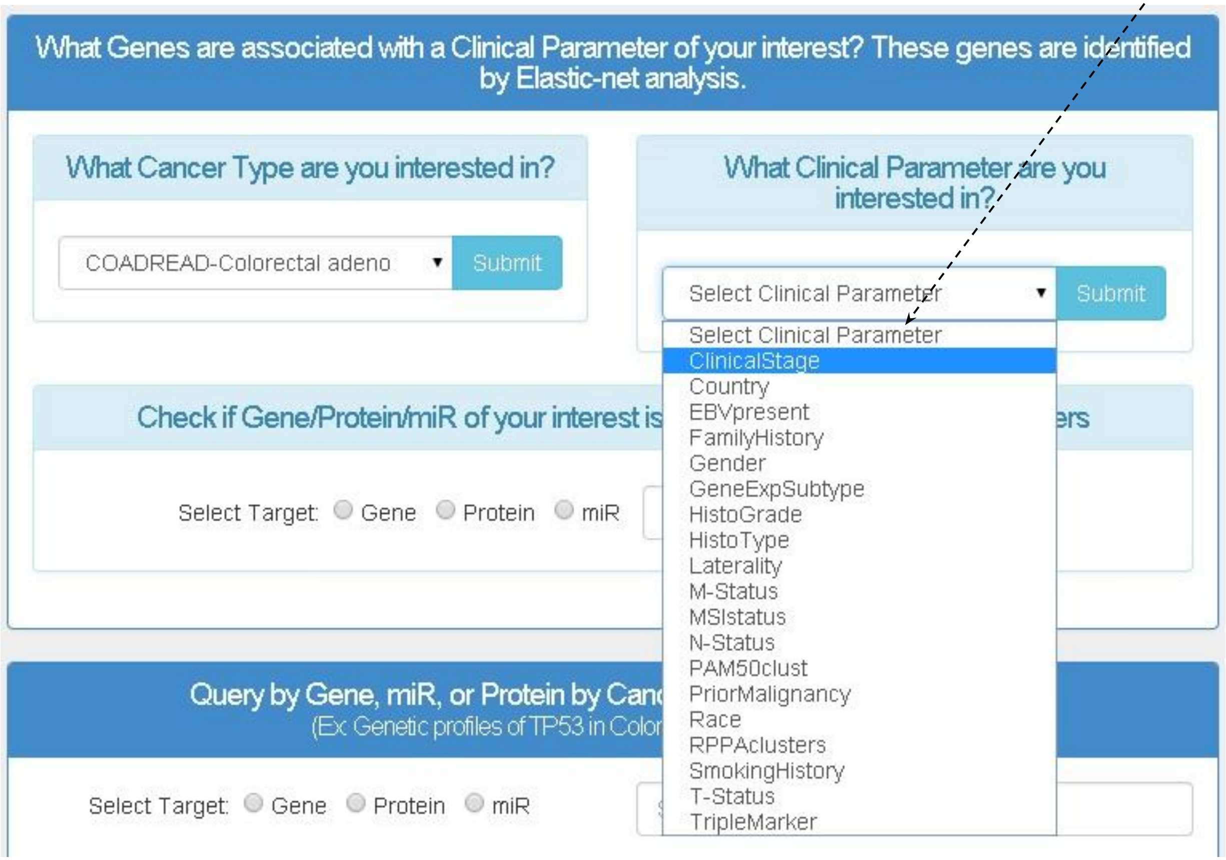
- BlackSpecific
- WhiteSpecific

T-Status

| #Candidates | #Samples |
|---|---|
| Genes - 0 | 213 |
| Protein - 23 | 460 |
| miRNA - 0 | 293 |

# What are the clinically relevant genes/miRs/proteins?

When you  are interested in a clinical parameter, click here and select a cancer type



What Genes are associated with a Clinical Parameter of your interest? These genes are identified by Elastic-net analysis.

What Cancer Type are you interested in?

What Clinical Parameter are you interested in?

Check if Gene/Protein/miR of your interest is

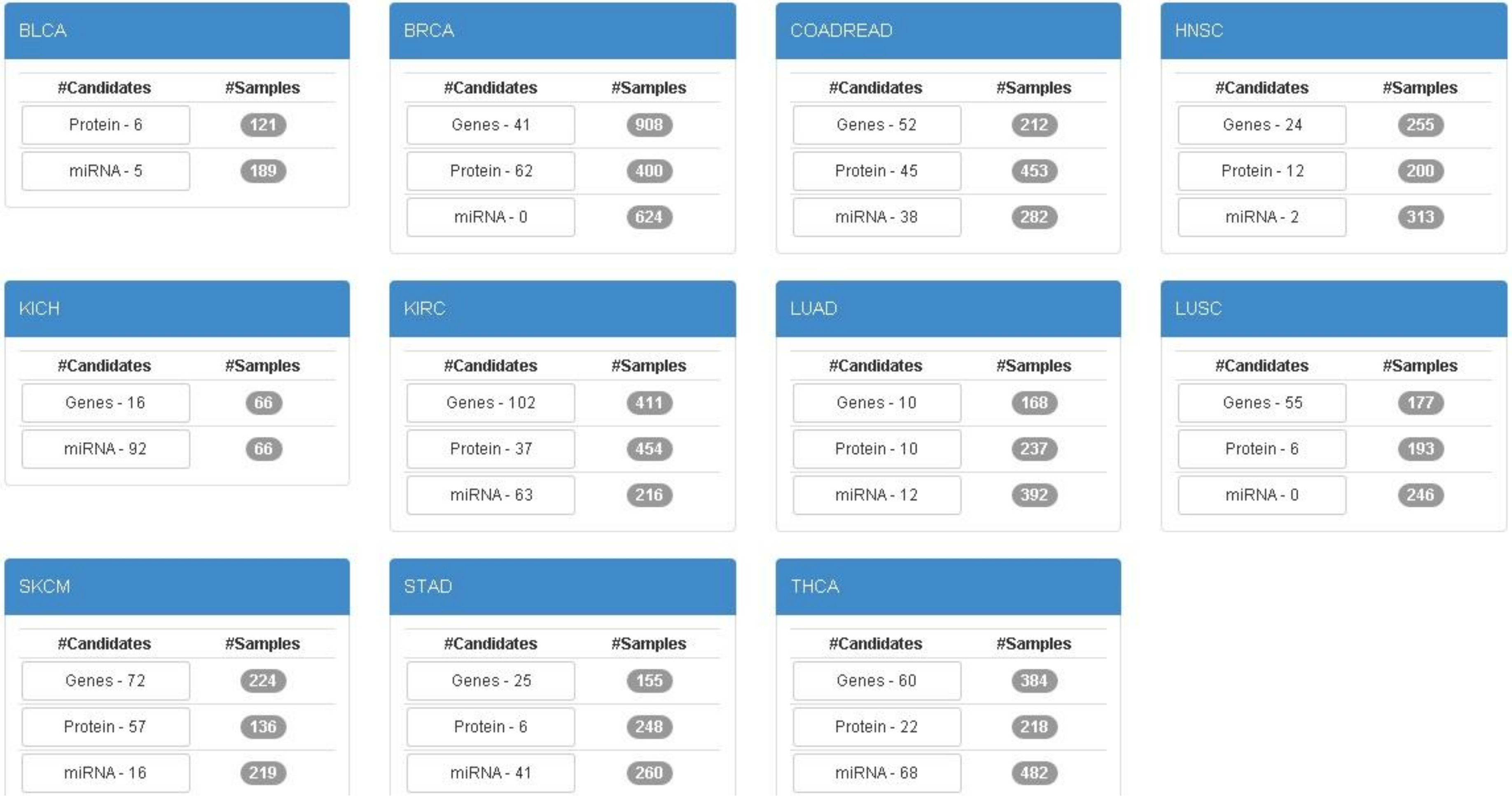
ers

Query by Gene, miR, or Protein by Canc

(Ex: Genetic profiles of TP53 in Color

# What are the clinically relevant genes/miRs/proteins?

If you select clinical stage, webpage shows the summary list with from all the cancer types which clinical stage is available



BLCA

| #Candidates | #Samples |
|---|---|
| Protein - 6 | 121 |
| miRNA - 5 | 189 |

BRCA

| #Candidates | #Samples |
|---|---|
| Genes - 41 | 908 |
| Protein - 62 | 400 |
| miRNA - 0 | 624 |

COADREAD

| #Candidates | #Samples |
|---|---|
| Genes - 52 | 212 |
| Protein - 45 | 453 |
| miRNA - 38 | 282 |

HNSC

| #Candidates | #Samples |
|---|---|
| Genes - 24 | 255 |
| Protein - 12 | 200 |
| miRNA - 2 | 313 |

KICH

| #Candidates | #Samples |
|---|---|
| Genes - 16 | 66 |
| miRNA - 92 | 66 |

KIRC

| #Candidates | #Samples |
|---|---|
| Genes - 102 | 411 |
| Protein - 37 | 454 |
| miRNA - 63 | 216 |

LUAD

| #Candidates | #Samples |
|---|---|
| Genes - 10 | 168 |
| Protein - 10 | 237 |
| miRNA - 12 | 392 |

LUSC

| #Candidates | #Samples |
|---|---|
| Genes - 55 | 177 |
| Protein - 6 | 193 |
| miRNA - 0 | 246 |

SKCM

| #Candidates | #Samples |
|---|---|
| Genes - 72 | 224 |
| Protein - 57 | 136 |
| miRNA - 16 | 219 |

STAD

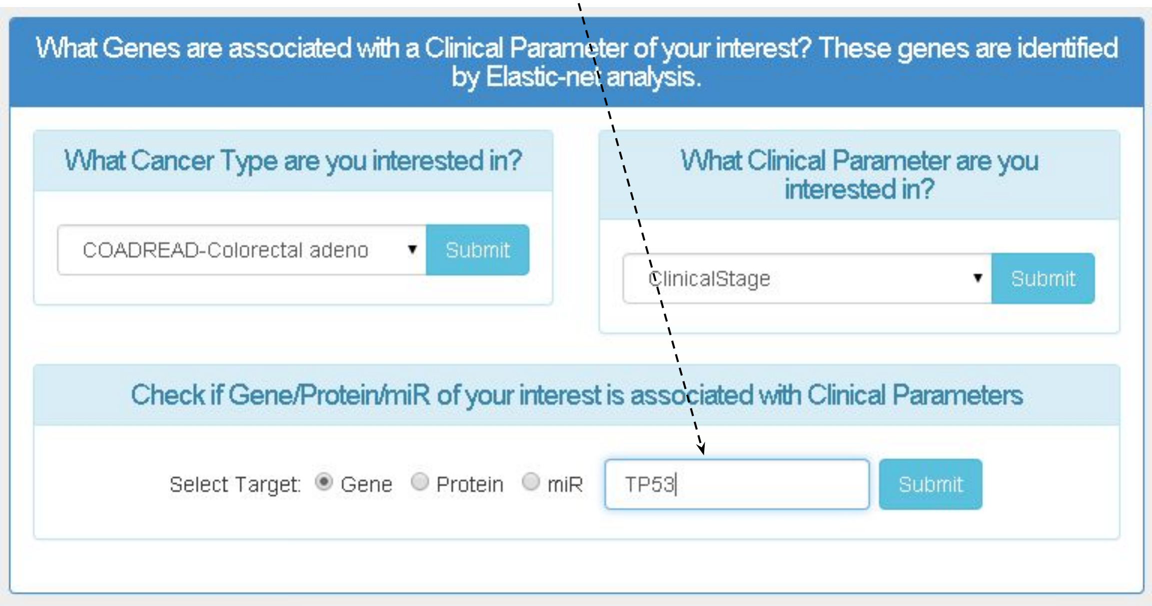
| #Candidates | #Samples |
|---|---|
| Genes - 25 | 155 |
| Protein - 6 | 248 |
| miRNA - 41 | 260 |

THCA

| #Candidates | #Samples |
|---|---|
| Genes - 60 | 384 |
| Protein - 22 | 218 |
| miRNA - 68 | 482 |

# What are the clinically relevant genes/miRs/proteins?

When you are wondering whether a gene of your interest is associated with clinical parameters or not, click here and type your gene/miR/protein name



What Genes are associated with a Clinical Parameter of your interest? These genes are identified by Elastic-net analysis.

What Cancer Type are you interested in?

COADREAD-Colorectal adeno

What Clinical Parameter are you interested in?

ClinicalStage

Check if Gene/Protein/miR of your interest is associated with Clinical Parameters

Select Target: ● Gene ○ Protein ○ miR

TP53

# What are the clinically relevant genes/miRs/proteins?

If you type ***TP53***, webpage shows the summary list with all the clinical parameters in cancers that TP53 are associated with

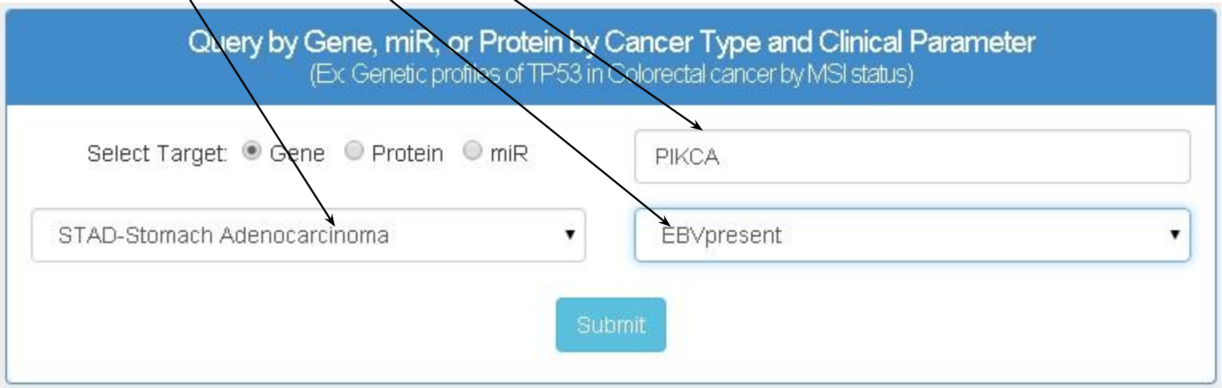
| Cancer Type | Clinical Parameter | Rank | Gene | Copy Number | mRNA expression | Methylation | Mutation | #Supporting genomic features |
|---|---|---|---|---|---|---|---|---|
| BRCA | Race | 283 | TP53 |  | 283 ↑ |  |  | 1 |
| BRCA | TripleMarker | 12 | TP53 | 13 ↑ |  |  |  | 1 |
| THCA | N-Status | 150 | TP53 |  |  | 147 ↓ |  | 1 |
| UCEC | HistoGrade | 62 | TP53 |  |  |  | 62 ↑ | 1 |

# Profiling by Clinical Parameter

When do you want to know the difference of a gene between samples with different types in terms of genetic/proteomic profiling, use middle panel

How does PIK3CA behave differently between EBV infected and non-infected samples in stomach cancer?

1. Type PIK3CA
2. Select STAD
3. Select EBV present
4. Click Submit



Query by Gene, miR, or Protein by Cancer Type and Clinical Parameter
(Ex: Genetic profiles of TP53 in Colorectal cancer by MSI status)

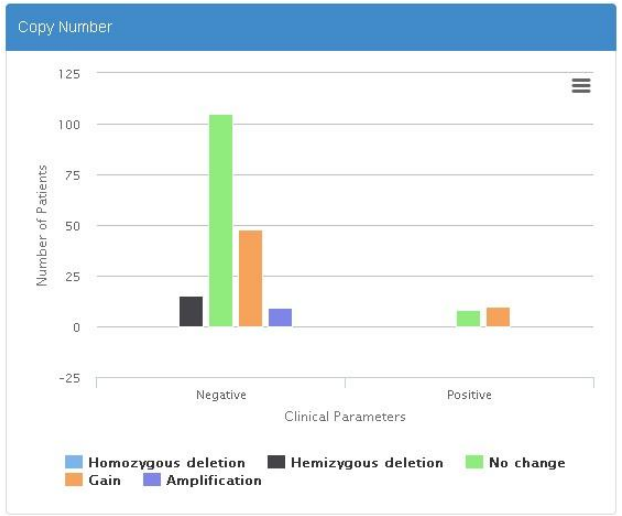
Select Target: ● Gene ○ Protein ○ miR

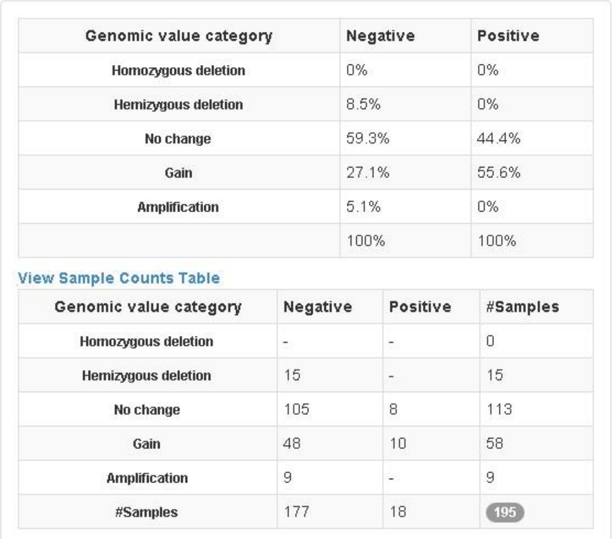
PIKCA

STAD-Stomach Adenocarcinoma ▾

EBVpresent ▾

# Profiling by Clinical Parameter

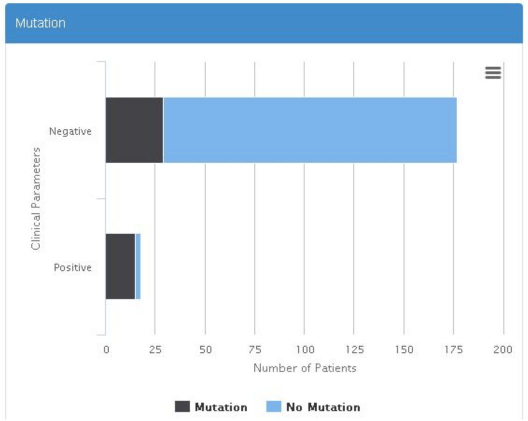


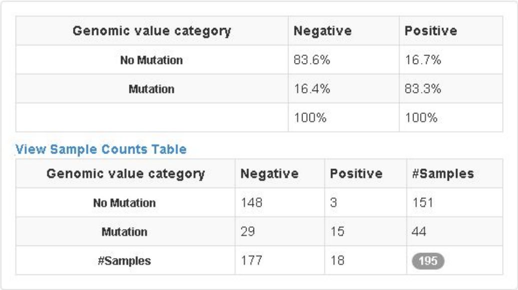


| Genomic value category | Negative | Positive |
|---|---|---|
| Homozygous deletion | 0% | 0% |
| Hemizygous deletion | 8.5% | 0% |
| No change | 59.3% | 44.4% |
| Gain | 27.1% | 55.6% |
| Amplification | 5.1% | 0% |
| | 100% | 100% |

View Sample Counts Table

| Genomic value category | Negative | Positive | #Samples |
|---|---|---|---|
| Homozygous deletion | - | - | 0 |
| Hemizygous deletion | 15 | - | 15 |
| No change | 105 | 8 | 113 |
| Gain | 48 | 10 | 58 |
| Amplification | 9 | - | 9 |
| #Samples | 177 | 18 | 195 |

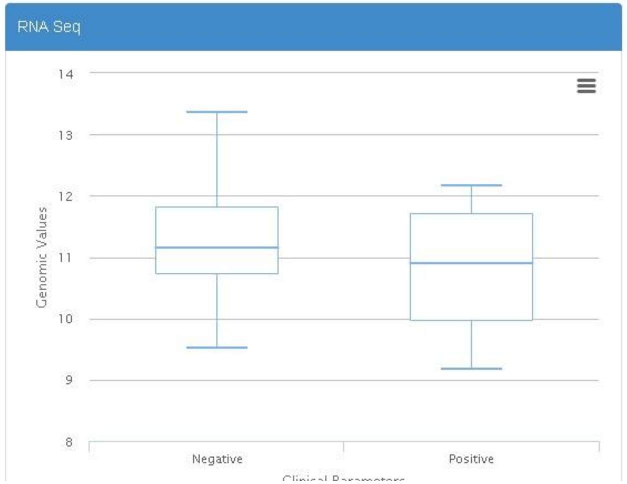




| Genomic value category | Negative | Positive |
|---|---|---|
| No Mutation | 83.6% | 16.7% |
| Mutation | 16.4% | 83.3% |
| | 100% | 100% |

View Sample Counts Table

| Genomic value category | Negative | Positive | #Samples |
|---|---|---|---|
| No Mutation | 148 | 3 | 151 |
| Mutation | 29 | 15 | 44 |
| #Samples | 177 | 18 | 195 |

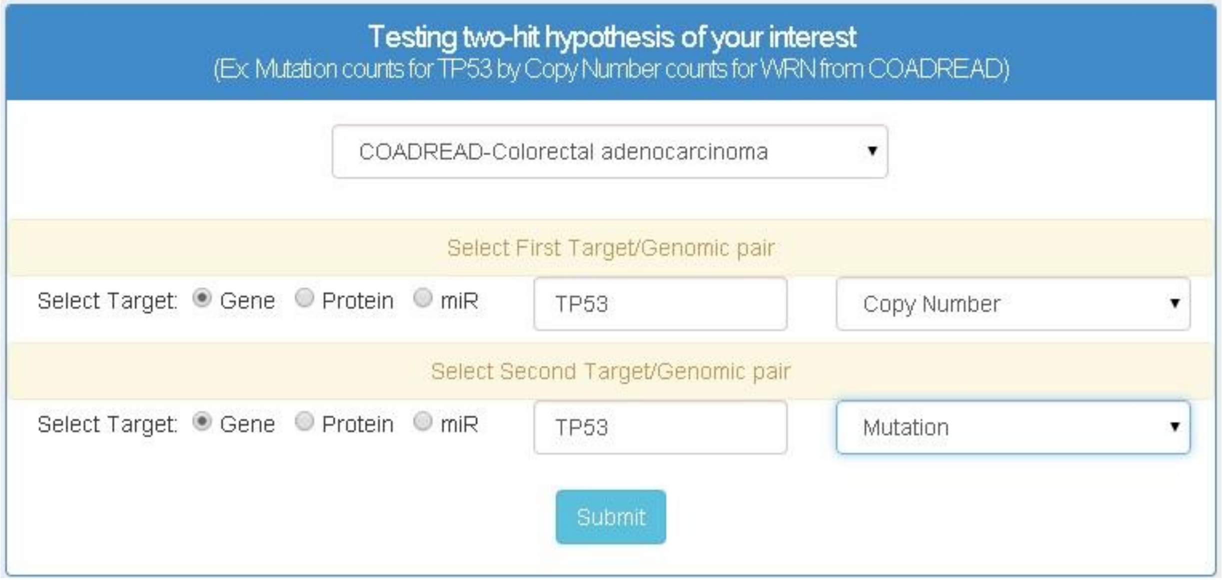


| Genomic value category | Negative | Positive |
|---|---|---|
| Minimum | 9.514 | 9.162 |
| Lower Quartile | 10.735 | 9.96 |
| Median | 11.155 | 10.892 |
| Upper Quartile | 11.807 | 11.714 |
| Maximum | 13.363 | 12.166 |

Summary of PIK3CA genetic profiles between EBV infected and non-infected samples in stomach cancer

# Testing two hit hypothesis

What is difference in copy number changes of TP53 between samples with and without TP53 mutation?
-> Use bottom panel



Testing two-hit hypothesis of your interest
(Ex: Mutation counts for TP53 by Copy Number counts for WRN from COADREAD)

COADREAD-Colorectal adenocarcinoma ▾

Select First Target/Genomic pair

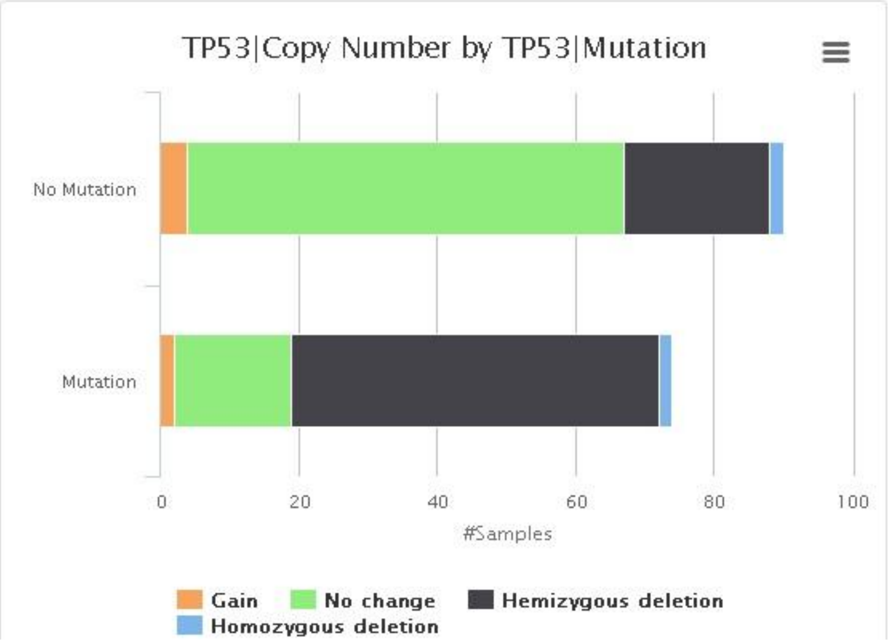
Select Target: ● Gene ○ Protein ○ miR | TP53 | Copy Number ▾

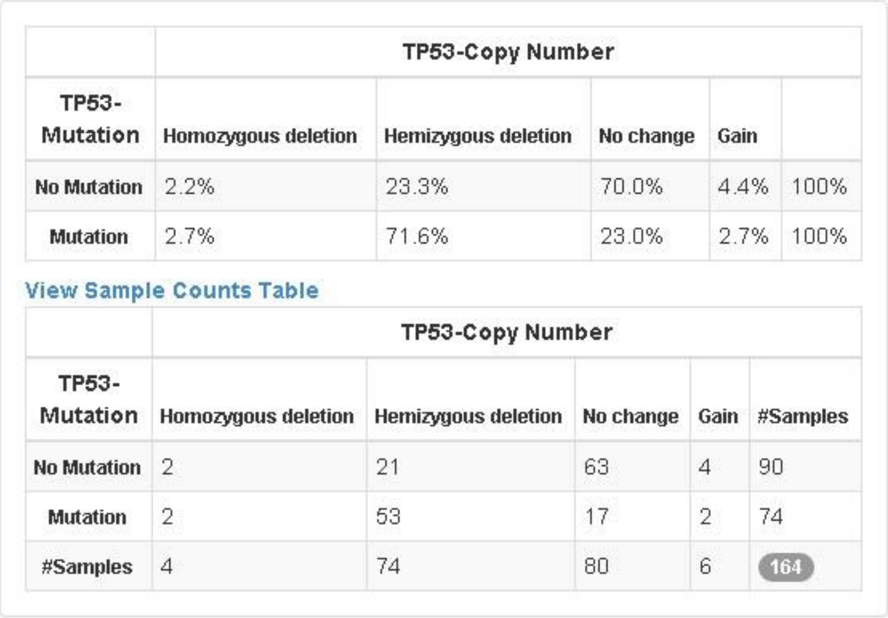
Select Second Target/Genomic pair

Select Target: ● Gene ○ Protein ○ miR | TP53 | Mutation ▾

# Testing two hit hypothesis

Summarize the copy number changes of ***TP53*** by samples with/without ***TP53*** mutations





| | TP53-Copy Number | | | | |
|---|---|---|---|---|---|
| **TP53-Mutation** | **Homozygous deletion** | **Hemizygous deletion** | **No change** | **Gain** | |
| **No Mutation** | 2.2% | 23.3% | 70.0% | 4.4% | 100% |
| **Mutation** | 2.7% | 71.6% | 23.0% | 2.7% | 100% |

**View Sample Counts Table**

| | TP53-Copy Number | | | | |
|---|---|---|---|---|---|
| **TP53-Mutation** | **Homozygous deletion** | **Hemizygous deletion** | **No change** | **Gain** | **#Samples** |
| **No Mutation** | 2 | 21 | 63 | 4 | 90 |
| **Mutation** | 2 | 53 | 17 | 2 | 74 |
| **#Samples** | 4 | 74 | 80 | 6 | 164 |