

The Cancer Genome Atlas (TCGA)

is a collaboration between the National Cancer Institute (NCI) and the National Human Genome Research Institute (NHGRI)



The screenshot shows the TCGA website homepage. At the top is a navigation bar with links: Home, About Cancer Genomics, Cancers Selected for Study, Research Highlights, Publications, News and Events, and About TCGA. The main content area features a large circular diagram on the left representing the TCGA Research Network, with various cancer types and data types labeled around the perimeter. To the right of this diagram is the 'Program Overview' section, which includes a brief description of the TCGA Research Network and a 'Learn More' link. Below the diagram is a row of four icons with labels: 'TCGA Data Used in Drug Development', 'Genomic Data Commons Launches', 'Cancers Selected for Study', and 'About TCGA'. The bottom section is divided into two columns: 'TCGA in Action' and 'News and Announcements'. The 'TCGA in Action' column features a case study from September 2016 about Loxo Oncology using TCGA data to develop a new therapy. The 'News and Announcements' column features two news items: one from June 06, 2016, about the launch of the Genomic Data Commons, and another from May 09, 2016, about the analysis of rare endocrine cancer. On the right side of the page, there is a 'Launch Data Portal' button, a 'Questions About Cancer' section with links to www.cancer.gov, 1-800-4-CANCER, and LiveHelp Online Chat, a 'Multimedia Library' section with links to Images, Videos and Animations, Podcasts, and Interactive content, and a 'Stay Connected' section.

Home **About Cancer Genomics** **Cancers Selected for Study** **Research Highlights** **Publications** **News and Events** **About TCGA**

Program Overview

Explore how The Cancer Genome Atlas works, the components of the TCGA Research Network and TCGA's place in the cancer genomics field in the Program Overview.

[Learn More ▶](#)

Launch Data Portal ▶

The Genomic Data Commons (GDC) Data Portal is an interactive data system for researchers to search, download, upload, and analyze harmonized cancer genomic data sets, including TCGA.

Questions About Cancer

Visit www.cancer.gov

Call **1-800-4-CANCER**

Use [LiveHelp Online Chat](#)

Multimedia Library

- [Images](#)
- [Videos and Animations](#)
- [Podcasts](#)
- [Interactive](#)

Stay Connected

TCGA in Action

September 2016
CASE STUDY: TCGA Data Leveraged for Developing FDA-Designated Breakthrough Therapy
Pharmaceutical company Loxo Oncology used TCGA data in the research that led them to develop FDA-designated Breakthrough Therapy LOXO-101, a promising new targeted therapy.

News and Announcements

June 06, 2016
Newly launched Genomic Data Commons to facilitate data and clinical information sharing
The Genomic Data Commons (GDC) is a data sharing platform that promotes precision medicine in oncology, and it will host all of the TCGA data.

May 09, 2016
Analysis of rare endocrine cancer reveals novel

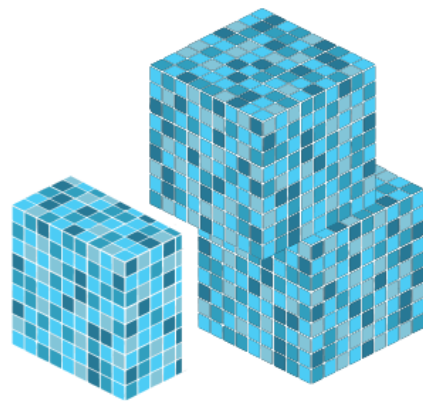
<http://cancergenome.nih.gov/>

TCGA produced over

2.5

PETABYTES

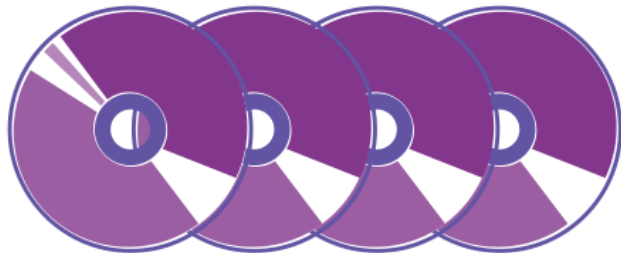
of data



To put this into perspective, **1 petabyte** of data is equal to

212,000

DVDs



TCGA data describes



33

DIFFERENT
TUMOR TYPES

...including

10

RARE
CANCERS

...based on paired tumor and normal tissue sets collected from



11,000

PATIENTS

...using

7

DIFFERENT
DATA TYPES



www.cancer.gov/ccg

Major TCGA Resources : Tumor samples and Data

Tumor Samples: large collection from 11K patients

- Example: September 2016
- Next-Generation Pathology: TCGA Microscope Slides Helped Train an Automated Lung Cancer Diagnostic Tool
- Using over 2,000 pathology slides of lung cancer from The Cancer Genome Atlas (TCGA), researchers from Stanford University trained a machine-learning pipeline to create the first computational model that analyzes image features to better predict patient outcomes.

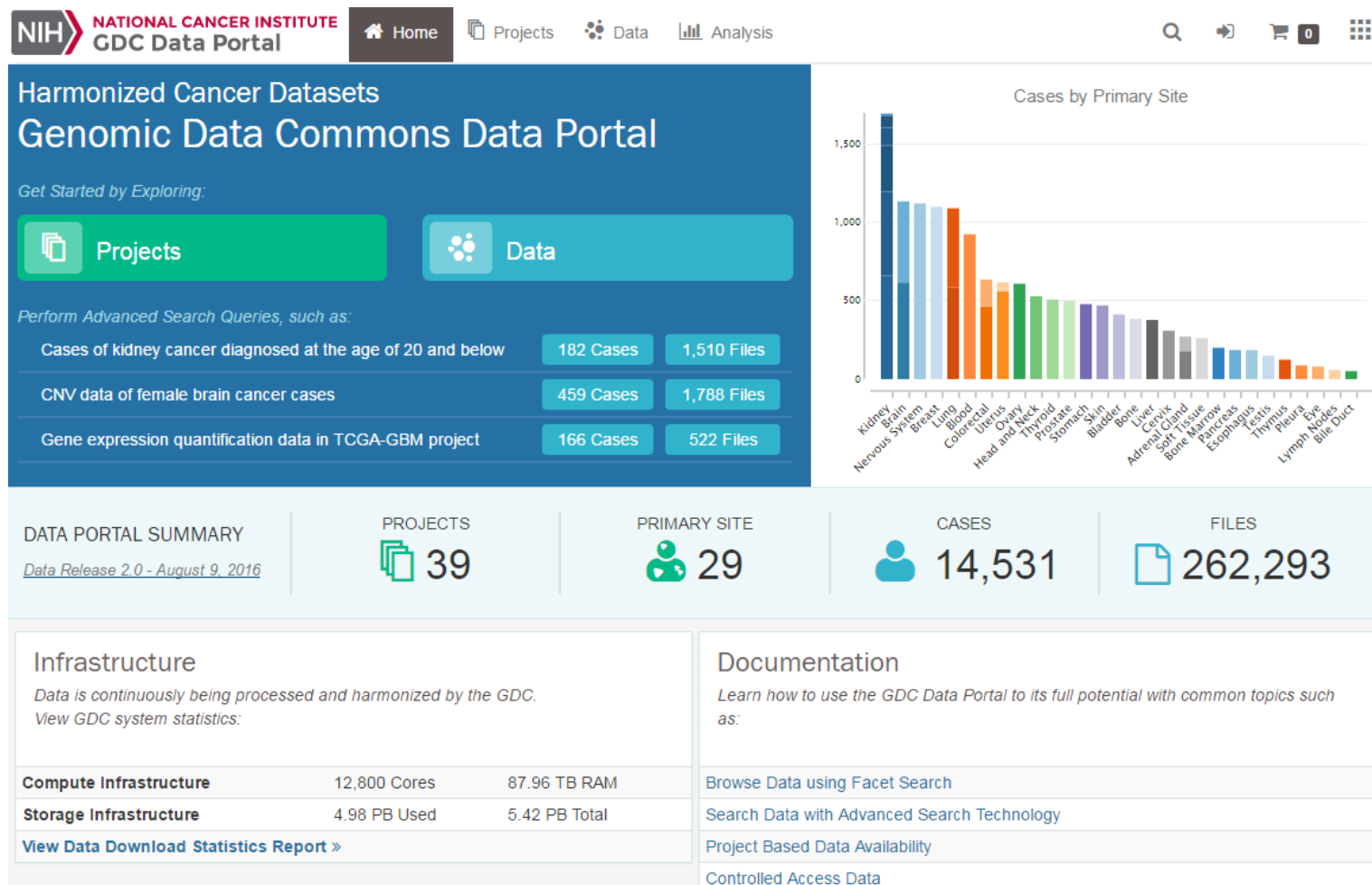
TCGA Resources: Genomic Data Commons (GDC)

NATIONAL CANCER INSTITUTE
GENOMIC DATA COMMONS



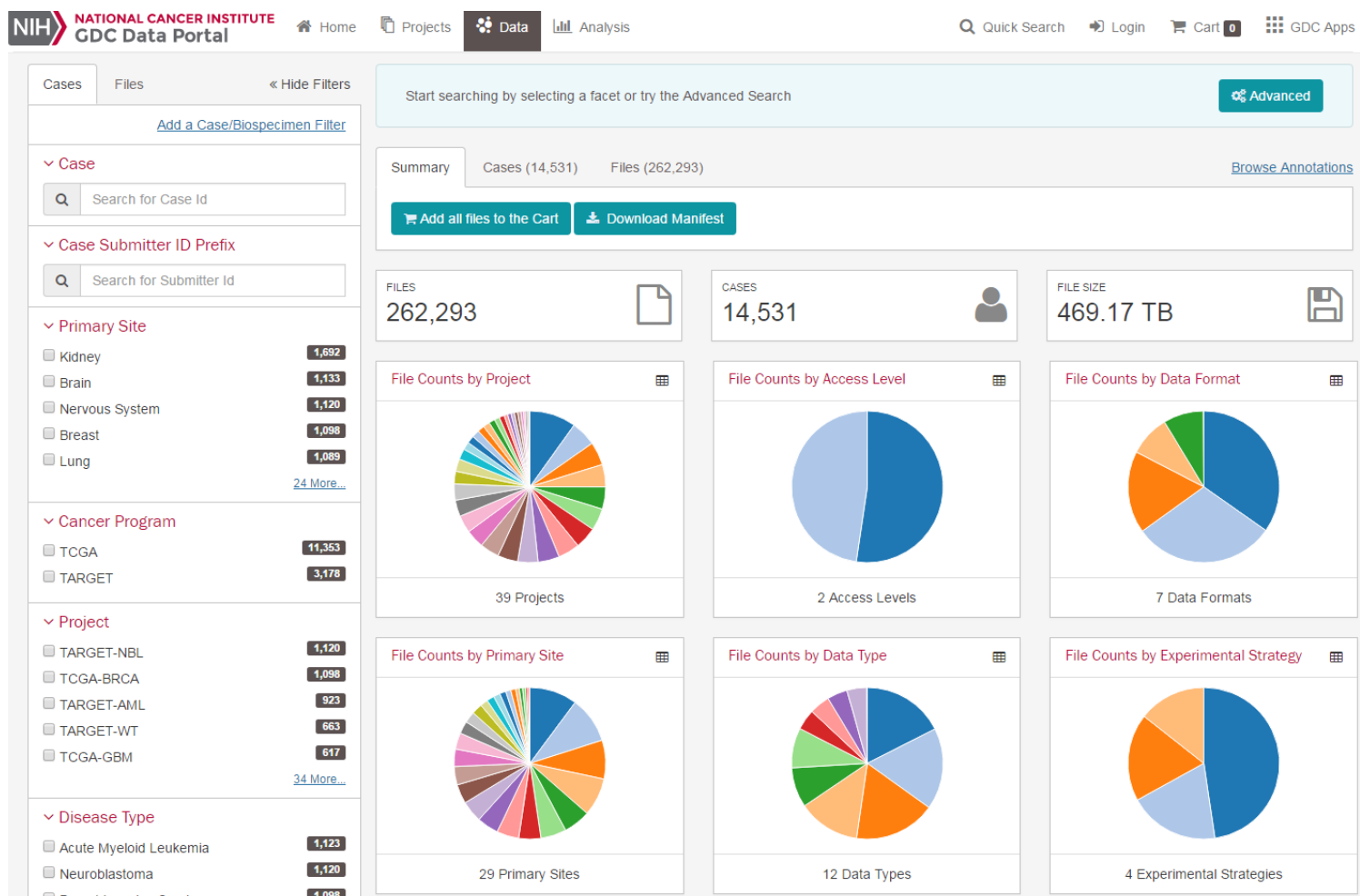
- Newly launched Genomic Data Commons to facilitate data and clinical information sharing (June 6, 2016)
- The Genomic Data Commons (GDC), a unified data system that promotes sharing of genomic and clinical data between researchers, launched on June 6, 2016 with a visit from Vice President Joe Biden to the operations center at the University of Chicago.
- An initiative of the National Cancer Institute (NCI), the GDC will be a core component of the National Cancer Moonshot and the President's Precision Medicine Initiative (PMI)
- The GDC will centralize, standardize and make accessible data from large-scale NCI programs such as The Cancer Genome Atlas (TCGA) and its pediatric equivalent, Therapeutically Applicable Research to Generate Effective Treatments (TARGET). NCI is part of the National Institutes of Health.

GDC – A Data Sharing Platform to Promote Precision Oncology



<https://gdc-portal.nci.nih.gov>

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<https://gdc-portal.nci.nih.gov>

TCGA Eco System: Other Important Resources

- Genomic Data Commons – U. Of Chicago
 - Data sharing platform
- Broad GDAC Firehose and FireBrowse - Broad Institute (MIT&Harvard)
 - TCGA Data Portal <http://gdac.broadinstitute.org/>
- cBio Portal for Cancer Genomics (Memorial Sloan-Kettering Cancer Center) www.cbioportal.org
- UCSC Cancer Genomics Browser (University Of California at Santa Cruz) <https://genome-cancer.ucsc.edu/>
- Cancer Cloud Pilots: Seven Bridges Cancer Genomic Cloud
 - Access to TCGA data collection and Data Analysis pipelines <http://www.cancergenomicscloud.org/>

FireHose and FireBrowse - Broad Institute



Search analysis results 🔍

[HOME](#)

BROAD GDAC

WEB API

FAQ

SAMPLES REPORT

AWG RESULTS

TUTORIAL

RELEASE NOTES

CONTACT

[View Expression Profile](#)

Enter gene name

 [View Analysis Profile](#)

SELECT COHORT

Clinical Analyses

CopyNumber Analyses

Correlations Analyses

miR Analyses

miRseq Analyses

mRNA Analyses

mRNAseq Analyses

Mutation Analyses

Pathway Analyses

RPPA Analyses

TCGA data version 2016_01_28



cBio Portal for Cancer Genomics (Memorial Sloan-Kettering Cancer Center)



Visualize, analyze, discover.



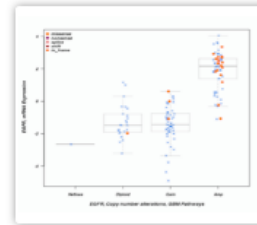
Memorial Sloan Kettering
Cancer Center.

[HOME](#) [DATA SETS](#) [WEB API](#) [R/MATLAB](#) [TUTORIALS](#) [FAQ](#) [NEWS](#) [TOOLS](#) [ABOUT](#) [VISUALIZE YOUR DATA](#)

The cBioPortal for Cancer Genomics provides **visualization**, **analysis** and **download** of large-scale **cancer genomics** data sets.

Please adhere to [the TCGA publication guidelines](#) when using TCGA data in your publications.

Please cite Gao et al. *Sci. Signal.* 2013 & Cerami et al. *Cancer Discov.* 2012 when publishing results based on cBioPortal.



What's New

New Jobs available at Dana-Farber to work on cBioPortal

Sign up for low-volume email news alerts:

Or follow us [@cbioportal](#) on Twitter

Data Sets

The Portal contains **147 cancer studies**. [\[Details\]](#)



Example Queries

RAS/RAF alterations in colorectal cancer

Query Download Data

Select Cancer Study:

Search...

☐ All (147)

☐ Adrenal Gland (1)

☐ Adrenocortical Carcinoma (1)

☐ Adrenocortical Carcinoma (TCGA, Provisional) 92 samples

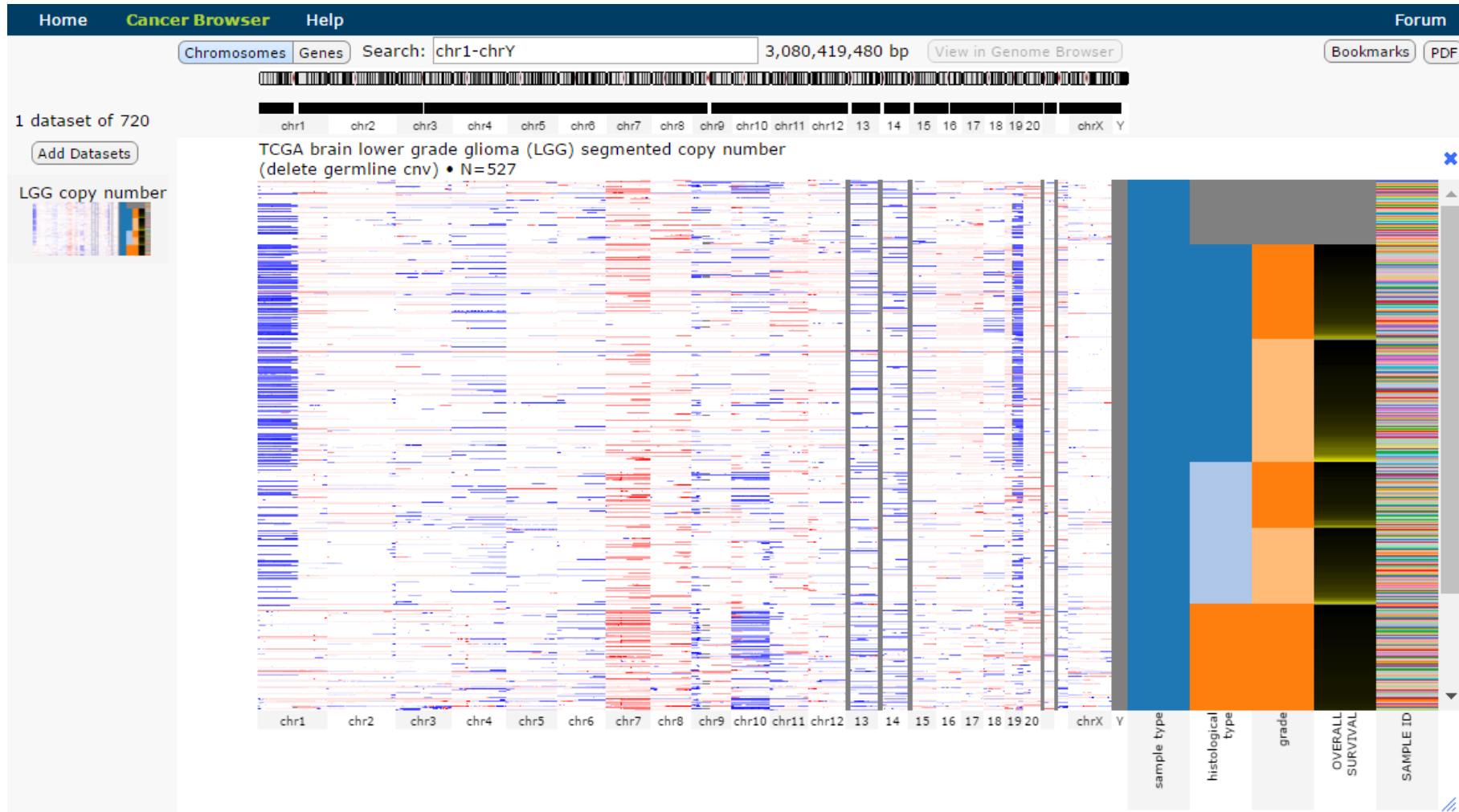
☐ Biliary Tract (5)

☐ Cholangiocarcinoma (4)

☐ Intrahepatic Cholangiocarcinoma (Johns Hopkins University, Nat Genet 2013) 40 samples

☐ Cholangiocarcinoma (National Cancer Centre of Singapore, Nat Genet 2013) 15 samples

UCSC Cancer Genomics Browser (University Of California at Santa Cruz)



Summary: Cancers Selected for Study by TCGA

http://cancergenome.nih.gov/pdfs/TCGA_Program_Brochure_2014

Breast

- Breast Ductal Carcinoma
- Breast Lobular Carcinoma

Central Nervous System

- Glioblastoma Multiforme
- Lower Grade Glioma

Endocrine

- Adrenocortical Carcinoma
- Papillary Thyroid Carcinoma
- Paranganglioma
- Pheochromocytoma

Gastrointestinal

- Cholangiocarcinoma
- Colorectal Adenocarcinoma
- Esophageal Cancer
- Liver Hepatocellular Carcinoma
- Pancreatic Ductal Adenocarcinoma
- Stomach Cancer

Gynecologic

- Cervical Cancer
- Ovarian Serous Cystadenocarcinoma
- Uterine Carcinosarcoma
- Uterine Corpus Endometrial Carcinoma

Head and Neck

- Head and Neck Squamous Cell Carcinoma
- Uveal Melanoma

Hematologic

- Acute Myeloid Leukemia
- Diffuse Large B-Cell Lymphoma
- Thymoma

Skin

- Cutaneous Melanoma

Soft Tissue

- Sarcoma

Thoracic

- Lung Adenocarcinoma
- Lung Squamous Cell Carcinoma
- Mesothelioma

Urologic

- Chromophobe Renal Cell Carcinoma
- Clear Cell Kidney Carcinoma
- Papillary Kidney Carcinoma
- Prostate Adenocarcinoma
- Testicular Germ Cell Cancer
- Urothelial Bladder Carcinoma

TCGA Results and Findings



MOLECULAR BASIS OF CANCER

Improved our understanding of the genomic underpinnings of cancer

For example, a TCGA study found the basal-like subtype of breast cancer to be similar to the serous subtype of ovarian cancer on a molecular level, suggesting that despite arising from different tissues in the body, these subtypes may share a common path of development and respond to similar therapeutic strategies.



TUMOR SUBTYPES

Revolutionized how cancer is classified

TCGA revolutionized how cancer is classified by identifying tumor subtypes with distinct sets of genomic alterations.*

www.cancer.gov/ccg



THERAPEUTIC TARGETS

Identified genomic characteristics of tumors that can be targeted with currently available therapies or used to help with drug development

TCGA's identification of targetable genomic alterations in lung squamous cell carcinoma led to NCI's Lung-MAP Trial, which will treat patients based on the specific genomic changes in their tumor.

Summary: Accomplishments of TCGA

- TCGA was initiated as a pilot project in 2006 by the National Cancer Institute and the National Human Genome Research Institute, both parts of the National Institutes of Health. Its goal was to comprehensively map and characterize the genomic changes in brain and ovarian cancers, as well as to prove that a national network of researchers could effectively collaborate to generate large-scale genomic data and make discoveries.
- The achievements of the pilot project led the National Institutes of Health to commit additional resources to TCGA for the characterization of more than *30 additional tumor types*, including nine rare cancers.
- This success of the expansion has inspired the creation of international programs like the International Cancer Genome Consortium, in which TCGA participates.