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TCGA Website Scavenger Hunt

QBIO Multi-omic Data Analysis

TCGA (Home Page):

The Cancer Genome Atlas (TCGA), founded in December of 2005, is a cancer genomics program hosted by the NCI and the National Human Genome Research Institute. The publicly available data from this project includes genomic, epigenomic, transcriptomic, and proteomic data. This data was collected from 20,000 different samples that span 33 different cancer types, including breast cancer, which we will be focusing on this semester.

Program History:

Describe one outcome or impact of TCGA: it helped advance health/science technologies by improving data quality, reducing costs of genome sequencing, and growing other molecular technologies

Briefly skim the "Timeline & Milestones" page. When did TCGA publish their paper on breast cancer?
October 2012

Because TCGA is a public dataset, and one of the first of its kind, they faced some initial concerns regarding the ethics of releasing health data to the public. Choose one of the papers in the "Ethics & Policies" section to skim. What is one way that your paper addresses these privacy concerns? The paper entitled Data Use Certification Agreement expects investigators to submit a project request, renewal, and progress checks. It also requires them to post about their research use publicly on the website. They are not allowed to further distribute the data

TCGA Cancers Selected for Study:

List three criteria used to select which cancers to study: Overall public health impact, availability of quality/quantity samples, and poor prognosis

Open the breast ductal carcinoma page and read TCGA's provided background. List one interesting fact you found: Since one of the subtypes shares genetic features with a type of ovarian cancer, scientists may be able to look to similar treatments, like drugs that inhibit blood vessel growth to cut off the blood supply to the tumor

Publications by TCGA:

TCGA published (at least) one paper on each of their studied cancer types. These papers, called marker papers, include an early analysis of the data, including any molecular characterizations that were performed. Read the abstract of the 2012 breast ductal carcinoma cancer paper. List any genes you come across (these may be good starting points for your future analyses of this cancer):

TP53, PIK3CA, GATA3, MAP3K1, HER2, EGFR

Using TCGA:

Go to the Genomic Data Commons (GDC) Data Portal via the link on TCGA home. This portal lets you view TCGA's data in a visual way. Let's explore this website. According to the Data Portal Summary, there are 72 projects in the GDC data portal. Now click on the "Projects" tab. Notice that not all projects in this data portal are TCGA-affiliated, though TCGA does make up 33 of the projects included.

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Using TCGA (Continued)

Under the "Program" tab, select just TCGA studies. According to the graph at the top of the page, TP53 is the most mutated gene in TCGA projects, affecting approximately 34 % of cases.

Return to the GDC Portal home page. Now click the breast image in the diagram to the right of the page. This directs you to the "Exploration" tab and automatically selects all primary sites associated with breast cancers. Now select TCGA as the program, and TCGA-BRCA as the as the project. This is the data we will be focusing on this semester.

The table on this page shows each patient along with their data. Feel free to explore the data files by clicking on any of the links provided.

Now explore the Cases, Genes, Mutations, and OncoGrid tabs above the pie charts. What is one takeaway from the plots provided here: Clinical plot shows that most of the patient data is from white patients

As you can see, the GDC portal provides an overwhelming amount of information. Feel free to continue to explore it on your own time!

Discussion:

Think through the following questions, and record your answers below:

1. What is the goal of TCGA?

I think the goal of TCGA is to provide source material that many different scientists can access. If we have multiple perspectives and minds working together, we can make faster advancements in health and technology

2. What are some ways that we use TCGA's data for our own cancer research? (Think about the types of data available and brainstorm some research questions that can be proposed given that data.)

I wonder if certain genes mutate more frequently together and how that may affect the survival rate. I also wonder if this cancer shares a profile with other cancers (like ovarian).

3. What are the benefits and drawbacks of TCGA or other large publicly available datasets?

I think the benefits are that with a lot of data, we can recognize trends effectively and address them. A disadvantage is that it relies on many people losing complete privacy to their health records.