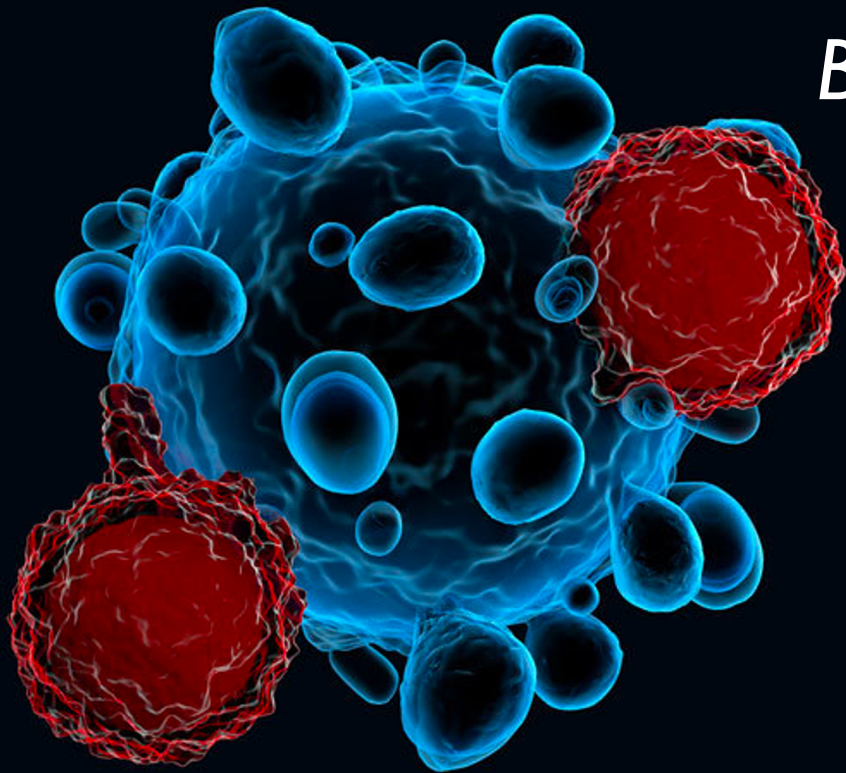


Leveraging Multi-Omics Data To Better Understand Cancer



Marina Sirota, PhD

Associate Professor

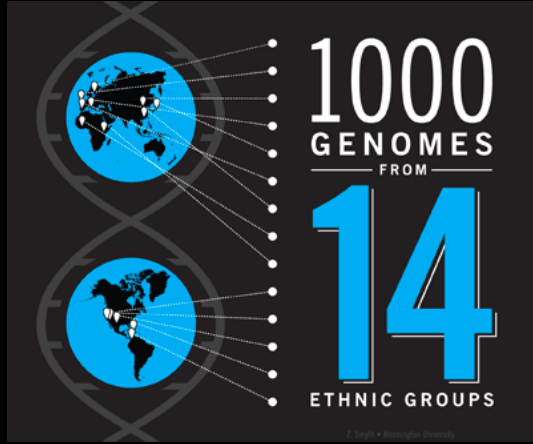


Sirota
Lab

UCSF

Bakar Computational Health
Sciences Institute

Why Now?



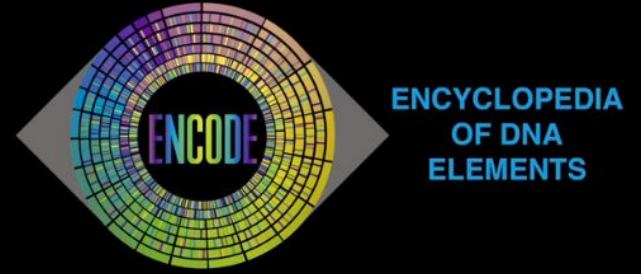
1000
GENOMES
FROM
14
ETHNIC GROUPS

The logo features two globes with lines connecting them to a central vertical line, symbolizing global genetic diversity.



GEO
Gene Expression Omnibus

The logo consists of the letters 'GEO' in a stylized blue font with a yellow shadow, above the text 'Gene Expression Omnibus'.



ENCODE
ENCYCLOPEDIA
OF DNA
ELEMENTS

The logo is a colorful circular graphic with the word 'ENCODE' in the center, surrounded by concentric rings of colored squares.



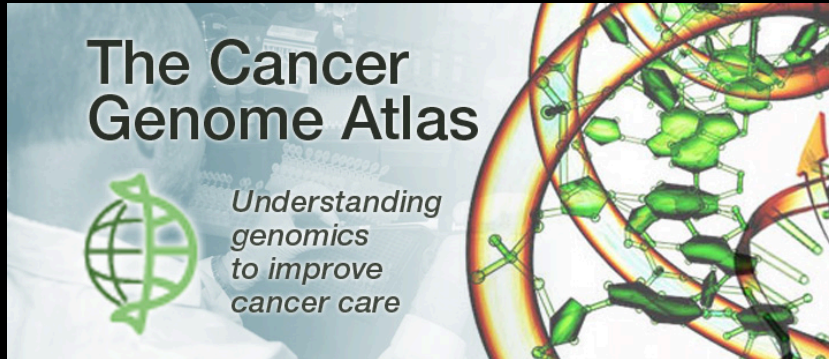
ExAC

The logo features the text 'ExAC' in a bold, black, sans-serif font.



NIH LINCS
PROGRAM

The logo includes a 3D cube graphic on the left and the text 'NIH LINCS PROGRAM' on the right, all set against a light blue background.



The Cancer
Genome Atlas

*Understanding
genomics
to improve
cancer care*

The logo features a green globe icon on the left and a 3D DNA double helix structure on the right.

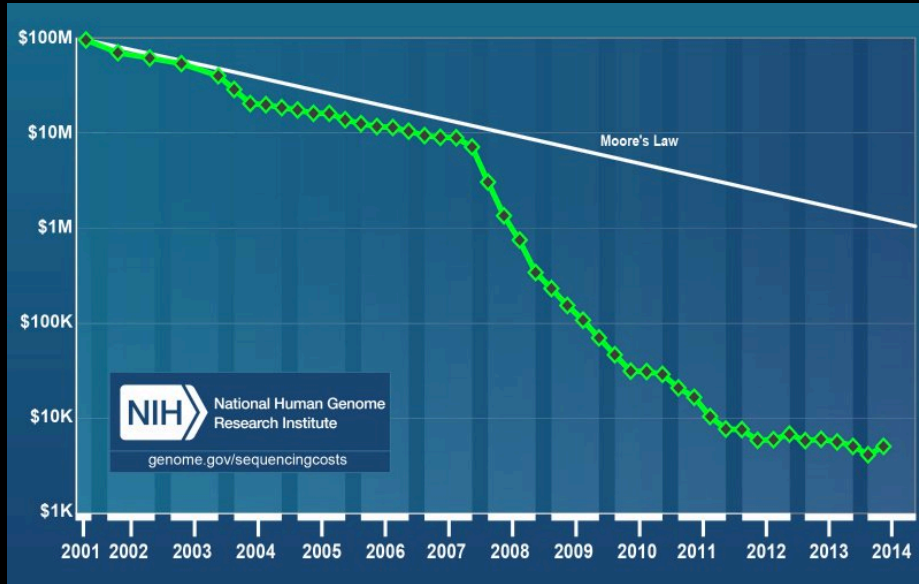


IMMPORT
BIOINFORMATICS FOR THE FUTURE OF IMMUNOLOGY

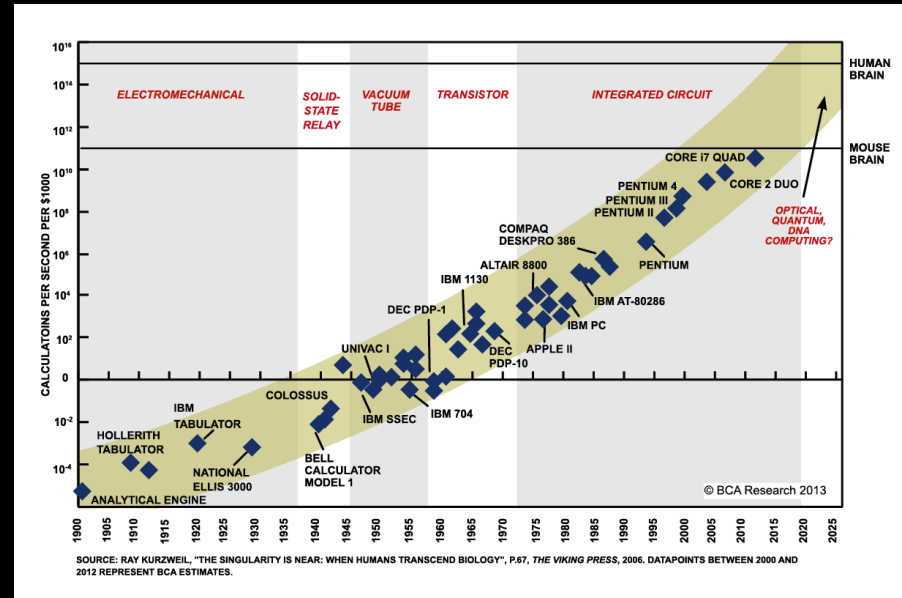
The logo features a stylized orange and grey starburst icon on the left and the text 'IMMPORT' in large orange letters above 'BIOINFORMATICS FOR THE FUTURE OF IMMUNOLOGY'.

Moore's Law – Biology and Computation

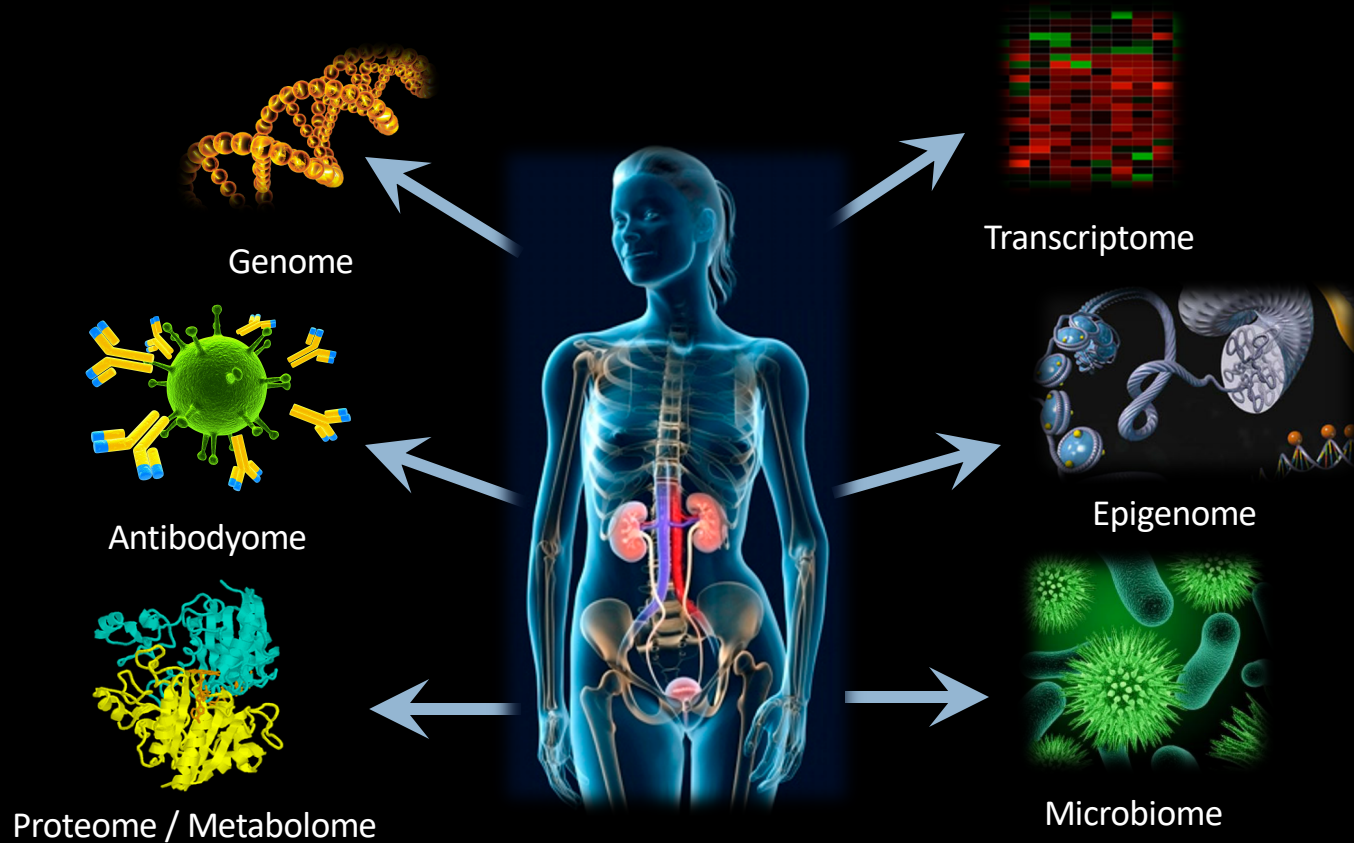
Cost Per Genome



Cost of Computational Resources



Integrative Personal “Omics” Profiling



UCSF Electronic Medical Records (EMR)

- Time span: 2012 – today
- Number of patients: 922,596
- Data included:
 - Allergies
 - Diagnosis
 - Encounters
 - Immunizations
 - Lab tests
 - Medications orders
 - Procedure orders
 - Vitals
 - Imaging



SEARCH 12 MILLION PATIENT RECORDS

- ✓ The UC ReX Data Explorer enables search of 12 million de-identified patient records from the 5 UC medical centers with one query
- ✓ Complete NIH targeted Enrollment Tables by providing counts of eligible patients by gender, race and ethnicity
- ✓ Increase cohort identification for the study of rare diseases
- ✓ Expand your study from a single to a multi-site proposal
- ✓ Obtain coordinated data provisioning support through UC ReX



UCSF Medical Center at Mission Bay opens

Large-scale transport completed with support of city of San Francisco agencies. (CLICK IMAGE TO VIEW)



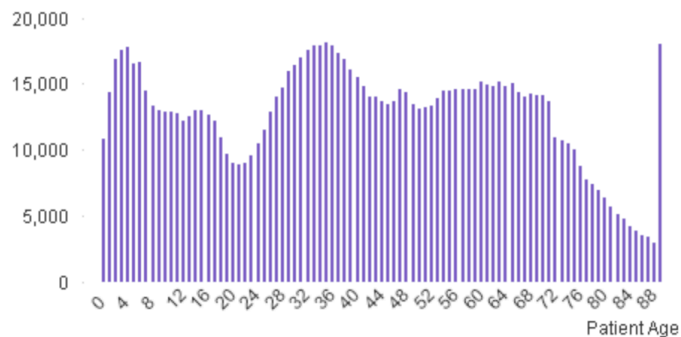
Patients **1,163,581 (100.0%)**

Deidentified patient data

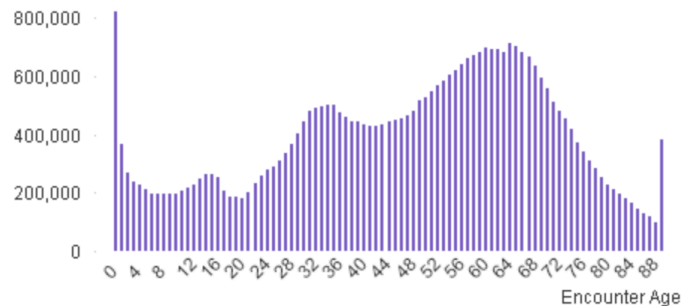
Full View

Top View

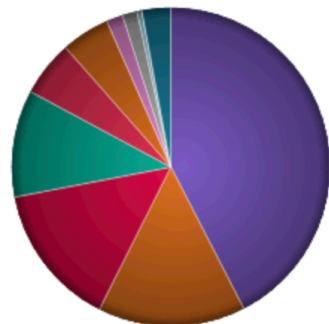
Patient Ages (current)



Patient Ages as of Encounter (count of encounters)

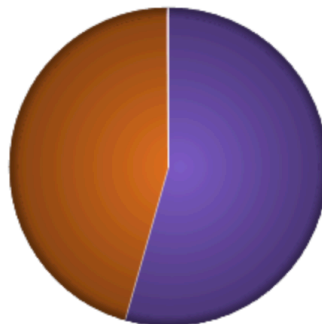


Race



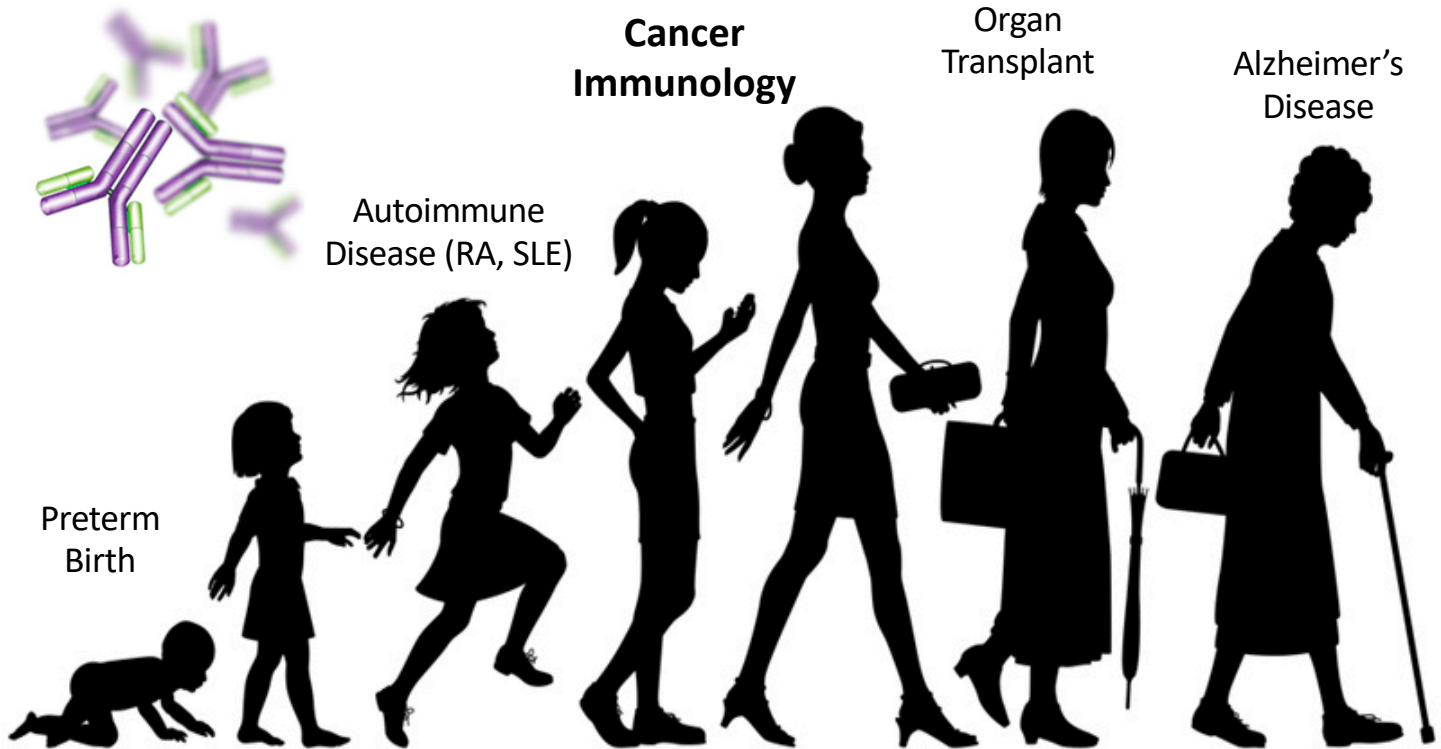
White or Caucas...	500,914
Unknown/Decline...	177,169
Other	171,869
Asian	128,188
Unknown	66,691
Black or Africa...	58,069
Declined	19,730
Native Hawaiian...	17,793
American Indian...	5,740
*Unspecified	6
-	34,565

Sex

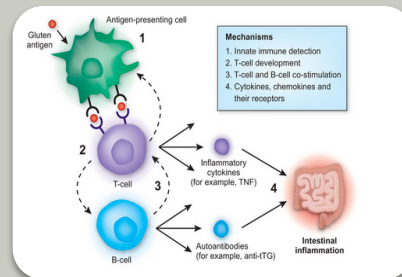


Female	633,080
Male	528,603
Unknown	1,550
*Unspecified	336
Nonbinary	12

Leveraging Computation to Understand Health and Disease Across the Lifespan...



Can we use data integration to...



Biomarker Discovery

... find better diagnostic markers?

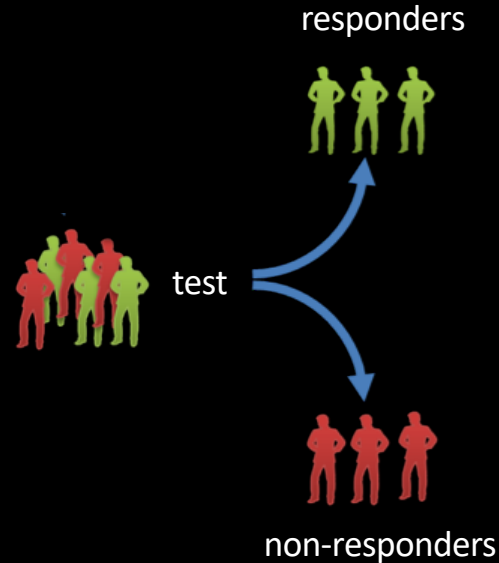
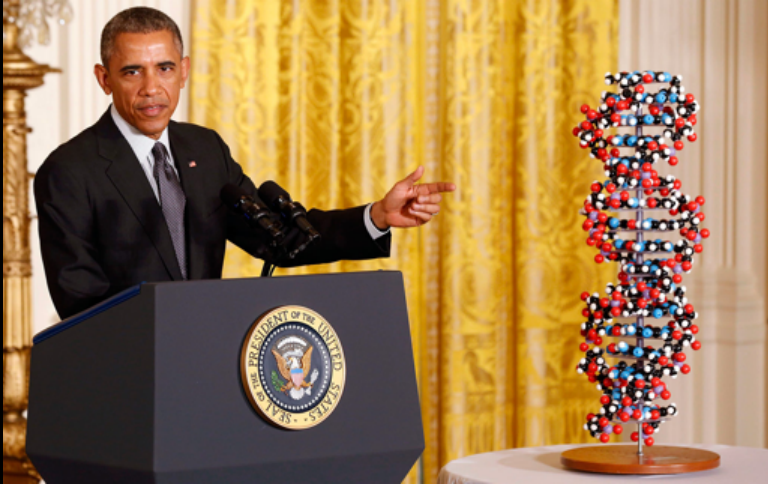
Therapeutics

... find new uses for existing drugs?

Disease Mechanism

... understand disease better?

Big Data → Precision Medicine



"Doctors have always recognized that every patient is unique, and doctors have always tried to tailor their treatments as best they can to individuals. You can match a blood transfusion to a blood type — that was an important discovery. What if matching a cancer cure to our genetic code was just as easy, just as standard? What if figuring out the right dose of medicine was as simple as taking our temperature?"

- President Obama, January 30, 2015