



WHAT'S GENOMIC SEQUENCING?

Genomics: The study of genes, their functions and related techniques.

Whole genome sequencing: Figuring out the order of DNA nucleotides, or bases, in a genome—the order of As, Cs, Gs and Ts that make up an organism's DNA.

Exome: All of the protein-encoding parts of the genes, which can contain a large number of relevant mutations.

Whole exome sequencing: A more efficient method for identifying disease-causing mutations because only the protein-encoding parts of genes are sequenced; accounts for about 1.5% of the full genome.

The most comprehensive method for analyzing the genome

Useful for identifying a molecular diagnosis in patients with a known or suspected genetic disorder

The Rise of Genomics Tests and Products

2018

52,000

GENETIC TESTS AVAILABLE

------2012 •••••• 1,000

COST OF SEQUENCING 1 HUMAN **GENOME**

2001 \$100 million

\$1,000



Use by Health Care Providers

2,000

Rare and common diseases that can be identified by genetic testing



57%

Hospitals using genomic testing in 2018 to provide personalized care to patients

MARKET SIZE **GROWTH** 2017

billion

2026

\$11.9 billion

Genetic Research LARGE STUDIES AND INITIATIVES UNDERWAY:

Genomics England Genomes Project:

500,000 100,000



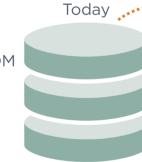
Dubai 10X Initiative:

5 million



Storage + Infrastructure

RAW DATA STORAGE FROM ONE GENOME **TAKES**



100 gigabytes 200 gigabytes

In 10 years

Some experts estimate between 100 million human genomes will

be stored by 2025.

Sequencing tumor creates 2 terabytes 2 terabytes of storage holds:

34,000 hours of music

■ 620,000 photos

1,000 hours of video

Growth to exceed the data requirements for YouTube or the entire field of astronomy.



Genomics and Early Detection

Genetic testing can identify risk for hereditary disease, like breast cancer caused by BRCA1 and BRCA2 gene mutation

Treatment of breast cancer at earlier (vs. later) stages of the disease is associated with better survival outcomes

Stage I/II \$82,121 Stage 0 \$60,637

\$129,387

Stage III

Stage IV \$134,682

Catching breast cancer at earlier stages can result in lower treatment costs.

Sources: American Health & Drug Benefits, Center for Connected Medicine Top of Mind for Top U.S. Health Systems 2018, Computer Weekly, Dubai Health Authority, Dubai 10X Initiative, Genomics England, Hospitals & Health Networks, Inkwood Research Global Genetic Testing Market Forecast 2018-2026, Mayo Clinic, MIT Technology Review, National Cancer Institute, National Institutes of Health, PC Ninja, PMLive, Scientific American, UK Biobank, U.S. Food & Drug Administration, Wired, World Health Organization











