

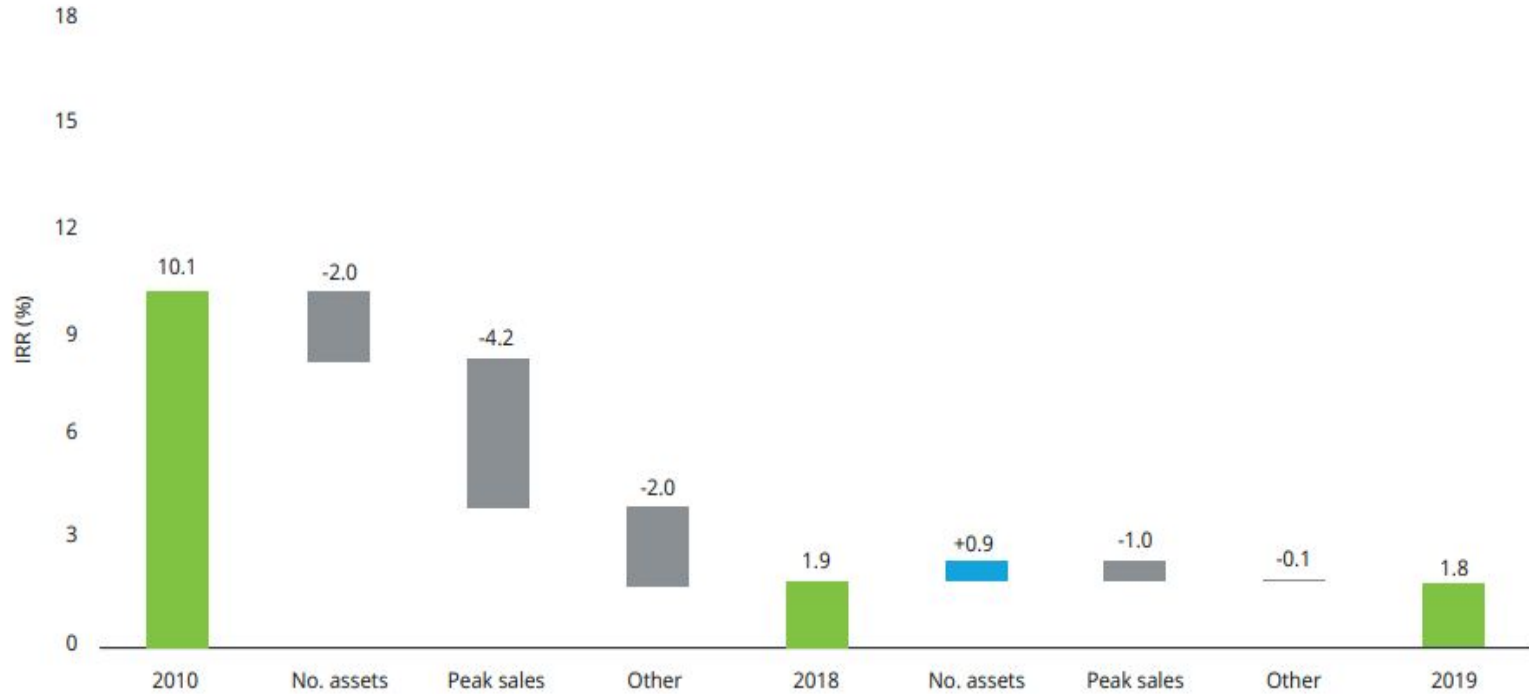
Opportunities for Human Bio-data Commercialization and Societal Benefits

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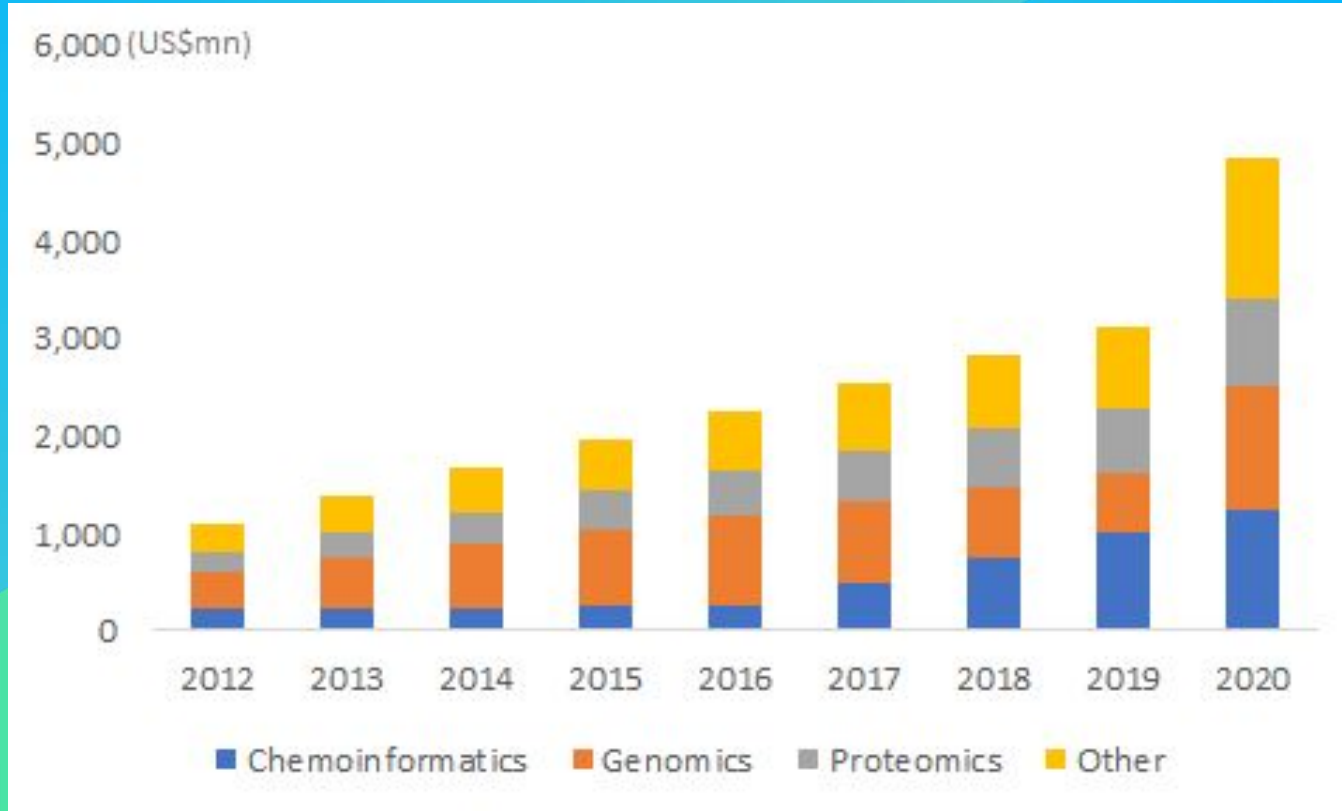
Overall impact of pipeline factors on change in IRR, 2010-18 and 2018-19 - original cohort



Source: Deloitte LLP, 2019



European Bioinformatics Market, by product (USDmn)



High Quality

The provenance of each datapoint must be clear, traceable and auditable.

Complete

Predefined rules for data abstraction, harmonization & quality monitoring.

Transparent

Specific aims and cohort selection criteria are precisely defined.

Generalizable

Broad range of patients.

Timely

Details about the time period, last update and number of potential candidates.

Scalable

- 1) balance between high touch vs automation;
- 2) a modular data model in multiple contexts; and
- 3) unambiguous variable definitions, particularly for endpoints.



Commerciality

Prevalence

Mortality rate

Unmet need

Applicability

Genetic disorders

Genetic mutations

Genetic control

Disease Classes

Cancer : Lung, Breast, Prostate, Pancreatic, CRC, AML,
Gastric, Liver

Rare Genetic Disorders

Central Nervous System Disorders



Data Type

Bioinformatics

Bioinformatics/
RWE

RWE

Data Applications

Analytical
Application

- Find ID novel targets
- Design compound libraries
- Predict target role in disease
- Predict drug-target interaction
- Predict drug impact on signaling pathways

- Predict structure-activity relationship
- Predict ADMET properties

- Drug repurposing or label extension
- Optimize patient recruitment
- Synthetic control arm

- Pharmacovigilance
- Marketing data

Drug Dev't
Process

Discovery

CMC

Pre-Clinical

Clinical Development

Commercialization



	Bioinformatics	RWE
Market Size	2018: USD 7.1-7.5 bn 2023: USD 14-20 bn	2025: USD 1.6 bn
CAGR	14.5-21.7%	15.0%

Source: Valuates Report, Markets and Markets, Meticulous Research



Experian's **\$1,000** valuations of medical records sold on the dark web.

In 2018, Optum generated about \$100 billion in revenues derived from 92 million patients served.

23andMe sold Parkinson's patient data, including NGS and questionnaire data for **US\$20,000** each.

Some clinical trial participants claim to receive as much as **\$40,000** per year.



Taiwan has unique advantages



**Diversified
Chinese Genome**



**Quality
Healthcare &
Data**



**Strong Personal
Data Protection
Laws**



**Established
Biobanks**

A 2016 analysis reported that 81% of the genomic studies were carried out in populations of European descent.

Source: Amy R. Bentley, Shawneequa Callier and Charles N. Rotimi



Thank You!

