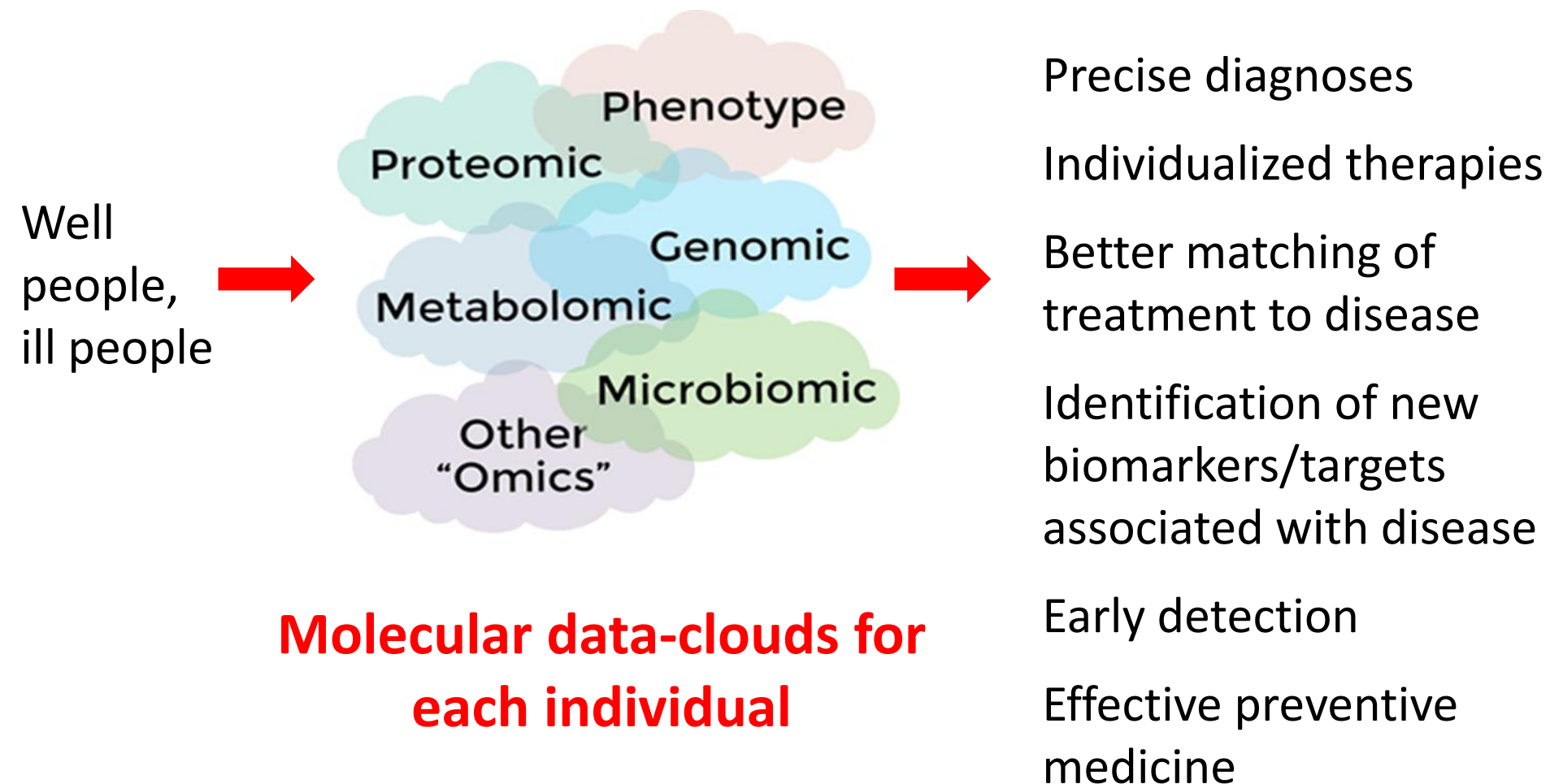


# Personalized Medicine: Improved Healthcare Through Comprehensive “Omic” Profiling



# There Are Many Forces Driving This New Form of Medicine

1. Rapid technological change (inexpensive molecular level analyses, advances in data science)
2. Patient safety (adverse reactions to prescribed drugs are the 4<sup>th</sup> leading cause of death)
3. Drug efficacy ( >50% of drugs don't work for individuals they are prescribed for)
4. Preventive medicine (need individualized, definitive data to avoid trending toward disease)
- 5. Consumer demand: want better ways to treat disease and maintain health!**

# Personalized Medicine Will Completely Disrupt Current Medical Practices

1. Power will move from the healthcare system to the healthcare consumer. Individualized molecular analyses will:
  - Provide accurate diagnostics of what is wrong with you
  - Suggest personalized therapies that are best for you
  - Provide ways to monitor whether therapy is effective
  - Provide ways to practice effective preventive healthcare
2. Medical care will shift from treating people after they become ill to preventing them getting ill (sick-care to healthcare)
  - Your doctor will increasingly become your health coach

# Enormous Efforts Being Made Worldwide

Name	Type	Main Objective	Cohort
Precision Medicine Initiative (US Government)	Public	Establish molecular (genomics) database for 1M Americans to conduct research to improve diagnostics and treatments for disease, starting with cancer	1M
100,000 Genomes Project (Genomics England, NHS)	Public	Establish database of 100,000 genomes to enable new discoveries to bring benefits to patients with rare diseases or cancer	100K (>30K done)
Million Veterans Project (US Dept. Veteran's Affairs)	Public	Establish database of genomic and medical data to understand how genes affect health and disease (diabetes, cancer, PTSD)	1M (>350K enrolled)
Personal Genome Project (Harvard)	Public	Establish open-access database of whole genome and clinical data to understand human traits and health	100K

# Enormous Efforts Being Made Worldwide

Name	Type	Main Objective	Cohort
Million Omics Database Project (BGI)	Private	Establish molecular medicine database that includes genomics, transcriptomics, epigenetics, metabolomic and microbiome data for health and commercial benefit	1M
23andMe	Private	Provide genome sequencing services to customers, establish database of genomic information for health research and development of new drugs	> 1M clients
The Baseline Study (Google)	Private	Collect genetic and molecular data to identify biomarkers for disease	> 100K
Human Longevity Inc.	Private	Compile comprehensive database (genomics, microbiomics, proteomics, etc) to understand aging and associated diseases	100K/yr

# Enormous Efforts Being Made Worldwide

Name	Type	Main Objective	Cohort
Human Genetics Initiative (Regeneron)	Private	Collect genetic information to develop new drug targets and PGx markers	> 100K
100K Wellness Project (Arrivale)	Private	P4 medicine using Omic profiling to enable preventive medicine	100K
Etc			

# In 2012 Decided We Had To Make An Effort Too, Formed the Personalized Medicine Initiative

## Objectives

1. Encourage a political/public commitment to personalized medicine
2. Establish coalition of healthcare, academic, industry & patients to promote personalized medicine
3. Take advantage of near-term opportunities for implementation and commercialization of personalized medicine
- 4. Enable a multi-Omic database for British Columbians**

**P. Cullis, M. Dawes, R. Fraser, D. Huntsman, B. McManus, J. Russell**

# To Establish Personalized Medicine Infrastructure the PMI Catalyzed Four Start-ups

1. GenXys Health Care Systems
2. Contextual Genomics
3. Microbiome Insights
4. Molecular You Corporation

**These companies have raised >\$10M and now  
employ ~100 people**



# The PMI Formed Molecular You Corp. (2014) To Perform Multi-Omic Profiling

**Molecular You Corporation: A Tri-University Start-Up**

**Principals:**

**UBC:** Pieter Cullis, Martin Dawes, Bruce McManus, Jim Russell, David Huntsman

**Universities of Victoria; McGill:** Christoph Borchers, The Proteomics Centre

**University of Alberta:** David Wishart, The Metabolomics Innovation Centre

**CEO:** Rob Fraser

# Molecular You Omic Profiling



## Genetic Profile

- Analysis of genome sequence:
- 700,000 SNPs

C. Ross



## Protein Profile

- Analysis of proteins in the blood:
    - ~150 proteins
- > 100 clinically approved biomarkers

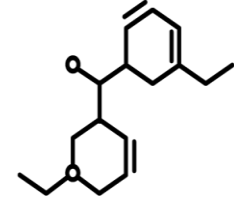
C. Borchers



## Microbial Profile

- Analysis of bacteria in gut :
  - >1,000 bacteria

B. Mohn, B. Findlay

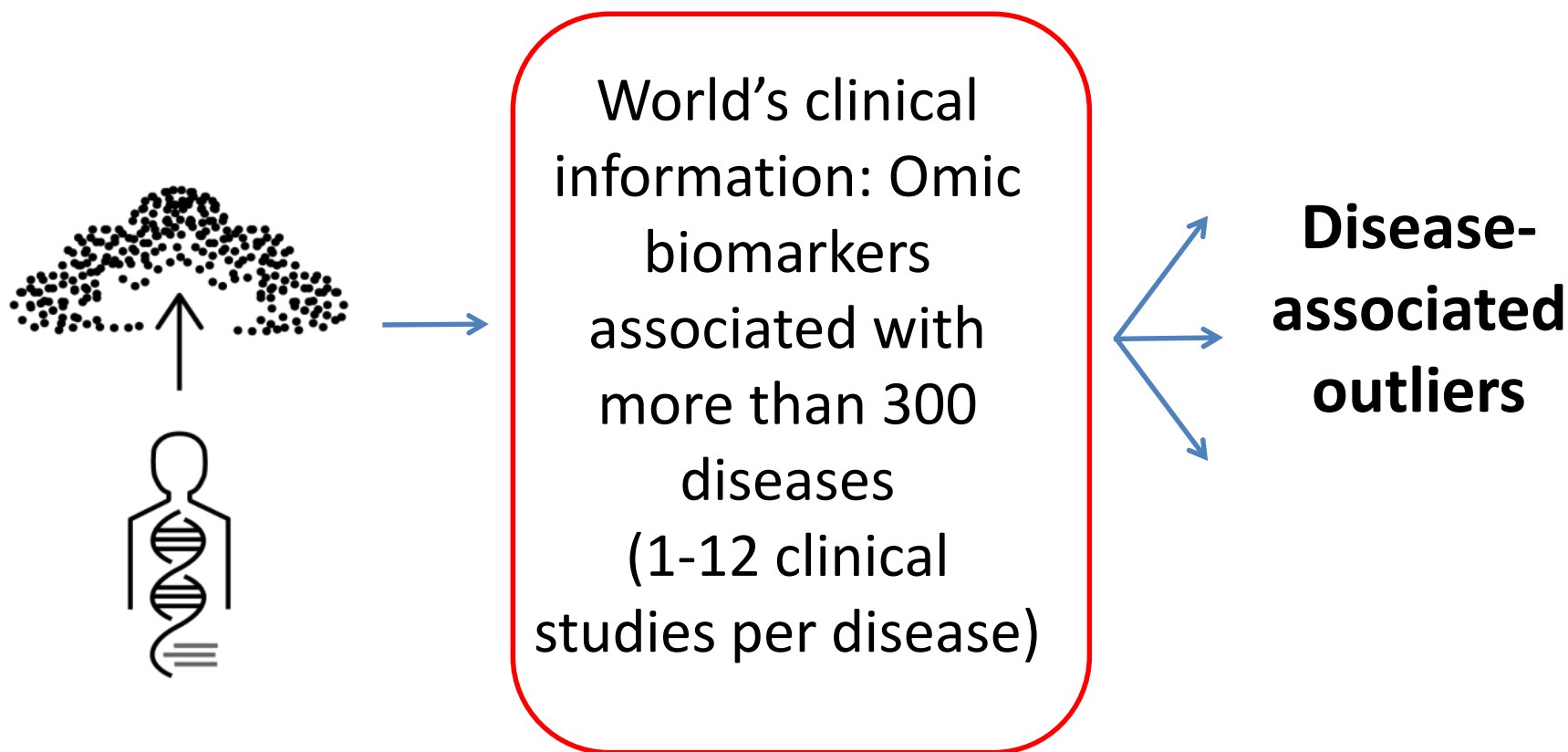


## Metabolite Profile

- Analysis of small molecules in blood:
    - ~150 metabolites
- ~100 clinically approved biomarkers

D. Wishart

# Your Data Cloud is Compared to a Curated Reference Database



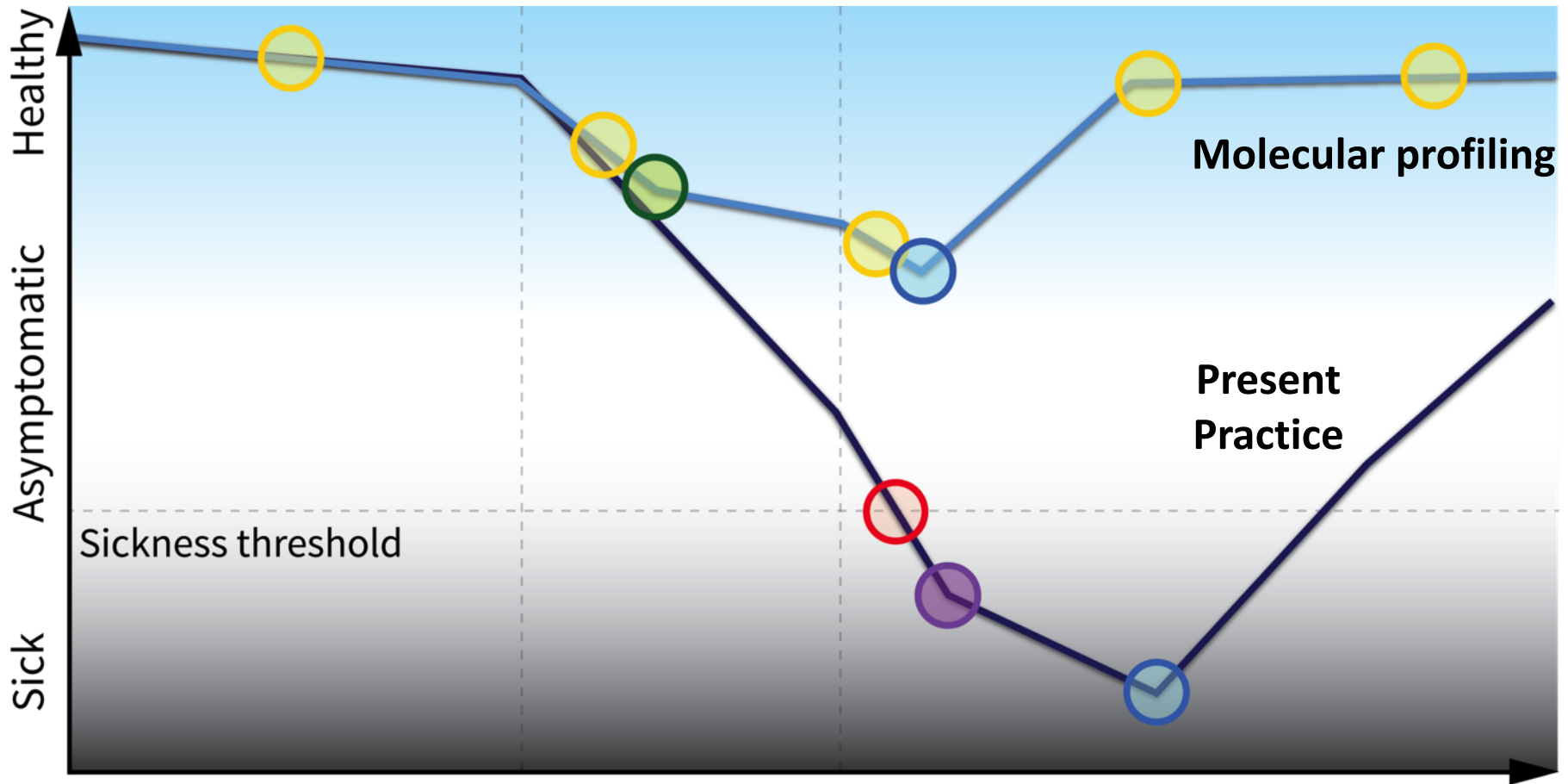
**“Big data” storage and analytics**

# Multi-Omic Profiling Results in an Extraordinarily Detailed Health Risk Assessment

## **My results:**

- 1) Relatively clean for cardiovascular risk (strong family history of heart attacks, strokes)**
- 2) Top risk was for diabetes, mainly genetic**
- 3) Initial profile indicated high levels of certain inflammatory markers, stepped up exercise program**
- 4) Low in serotonin, took supplement (5-HTP) to correct**
- 5) Liver in excellent shape!**

# Early Detection of Trends Towards Disease Allows Effective Preventive Care



**Preventive care: personalized diet, exercise, supplement programs based on your data**

# Omic Profiling Will Provide Data You Need to Achieve Better Health

Where are you on the health staircase?

All of us will have actionable findings

