

# DIGITAL HEALTH AND THE NHS



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# Disclosures/perspectives



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**Centre for the Advancement of  
Sustainable Medical Innovation**



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**South London's Academic Health  
Science Network**

**Genomics Network Alliance**

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**South London and the 100,000  
Genomes Project**

**Image Analysis**

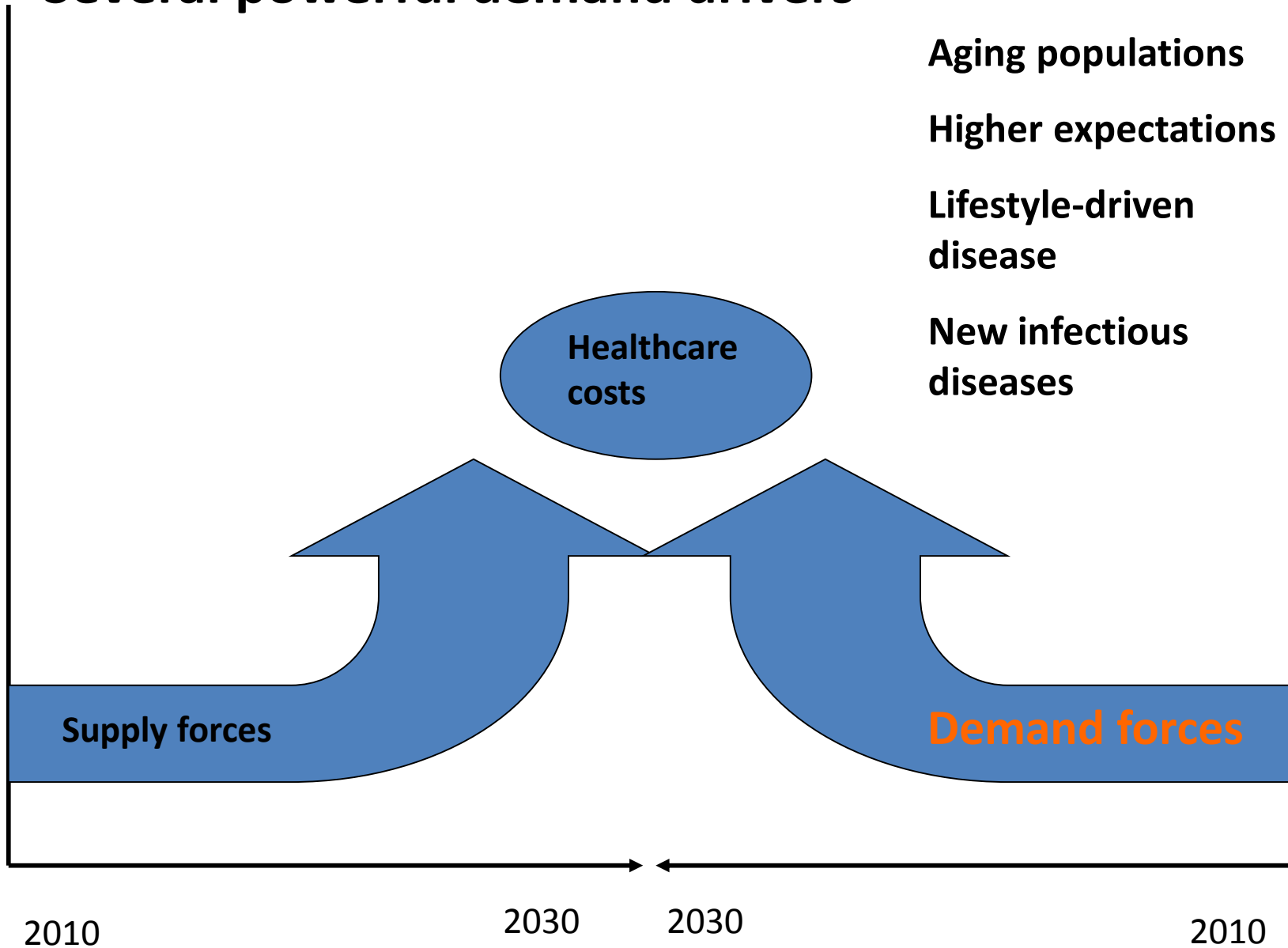
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**UK digital health SME  
quantifying results from MRI**

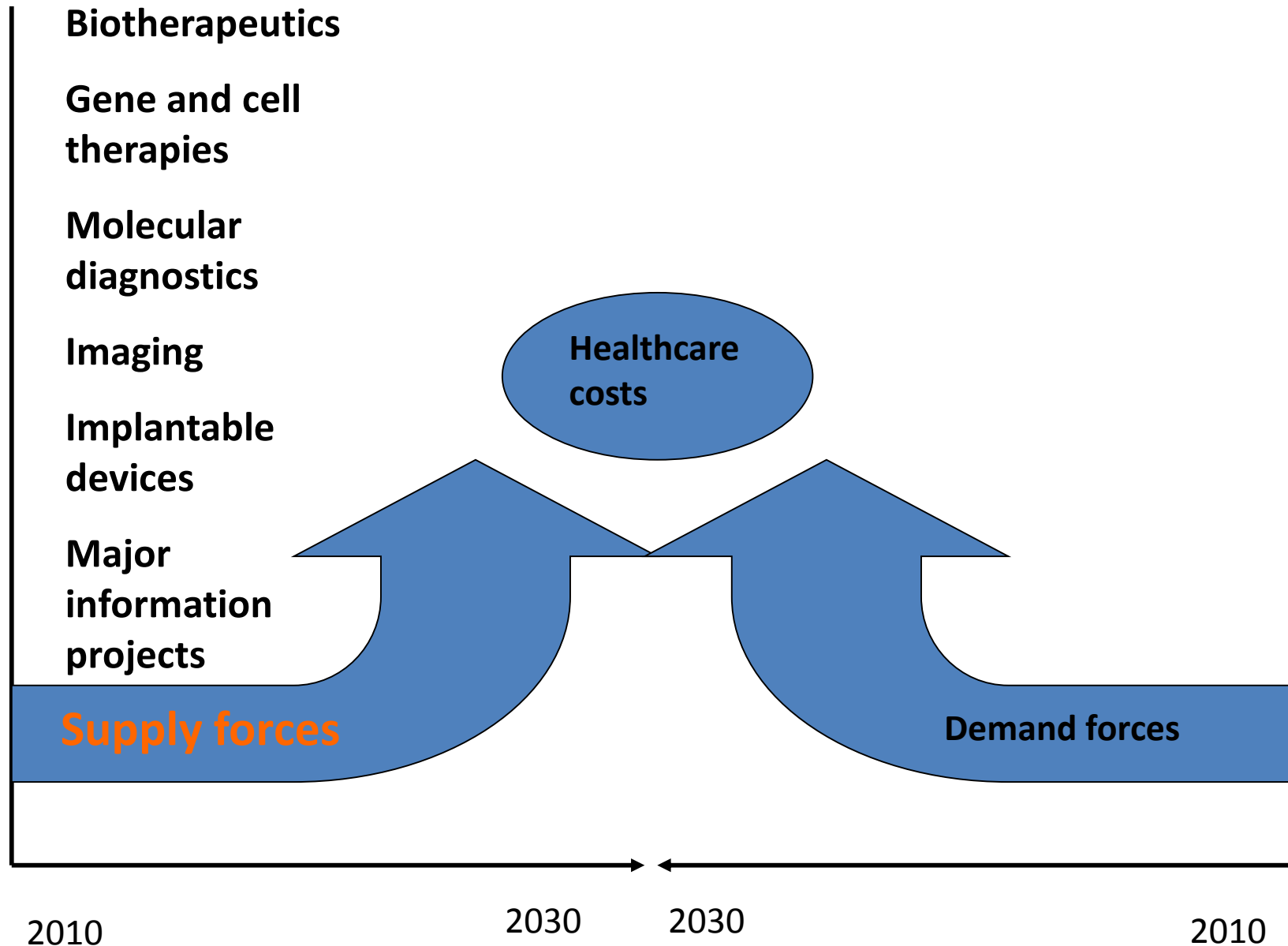
# Flow

- Healthcare as we know it today is unsustainable and needs radical change
- Just in time, we now have many of the tools needed to remake medicine
- Digital health is at the heart of change: EHRs, data analytics, clinical decision support, mobile health
- We will have major new sources of valuable data:
  - The Farr Institute, UK Biobank, Phenome, 1000,000 genome projects
- Dementia prevention, diagnosis and treatment is a case example
- Digital health can empower technology innovation, like drug R&D
- We have new mechanisms, like AHSNs, to spread useful tools
- But there are several ‘wicked issues’ and we need principles and an action plan to address them

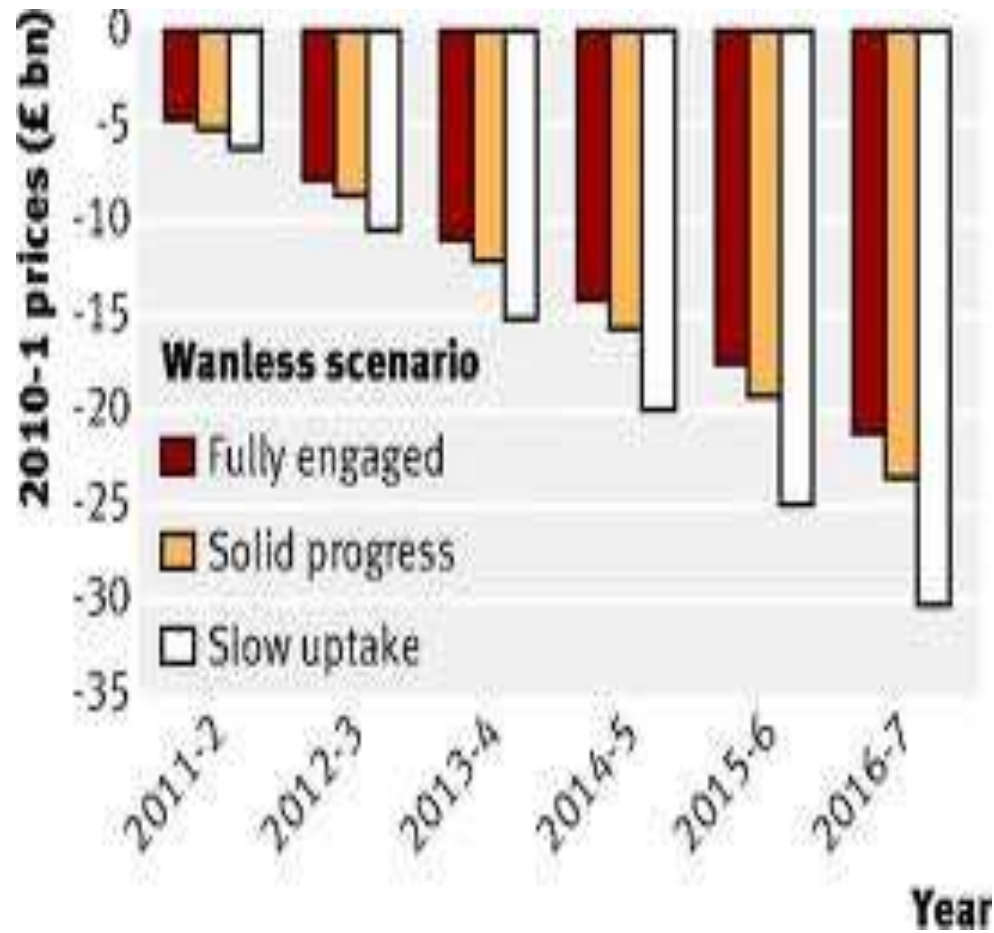
# Several powerful demand drivers



# Supply of new technologies also adds to healthcare costs



# Does anyone remember Derek Wanless?



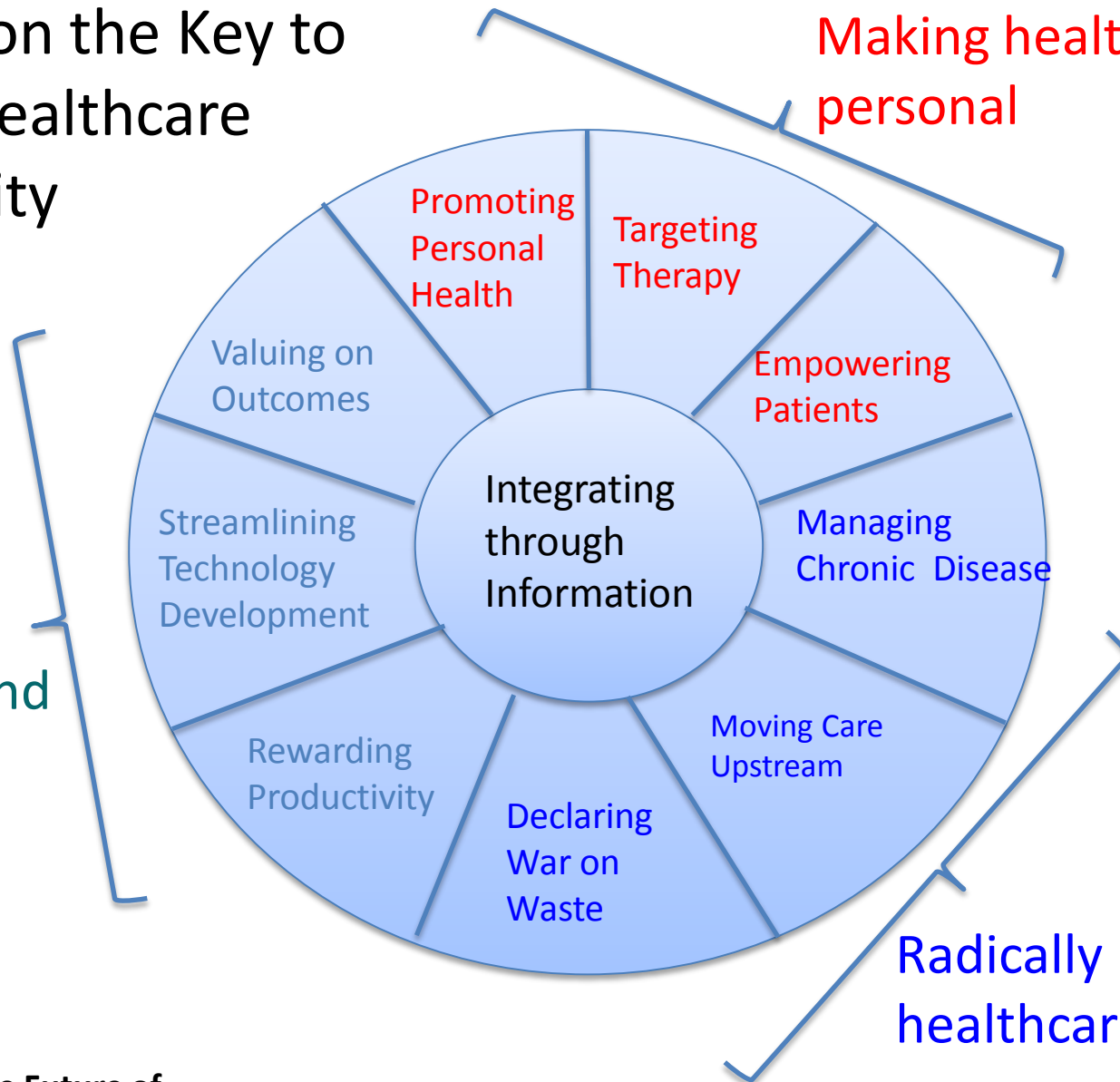
Without radical change – especially patient engagement – the system is unsustainable

5 year forward view:

“Twelve years ago Derek Wanless’ health review warned that unless the country took prevention seriously we would be faced with a sharply rising burden of avoidable illness. That warning has not been heeded – and the NHS is on the hook for the consequences”.

# Information the Key to Greater Healthcare Productivity

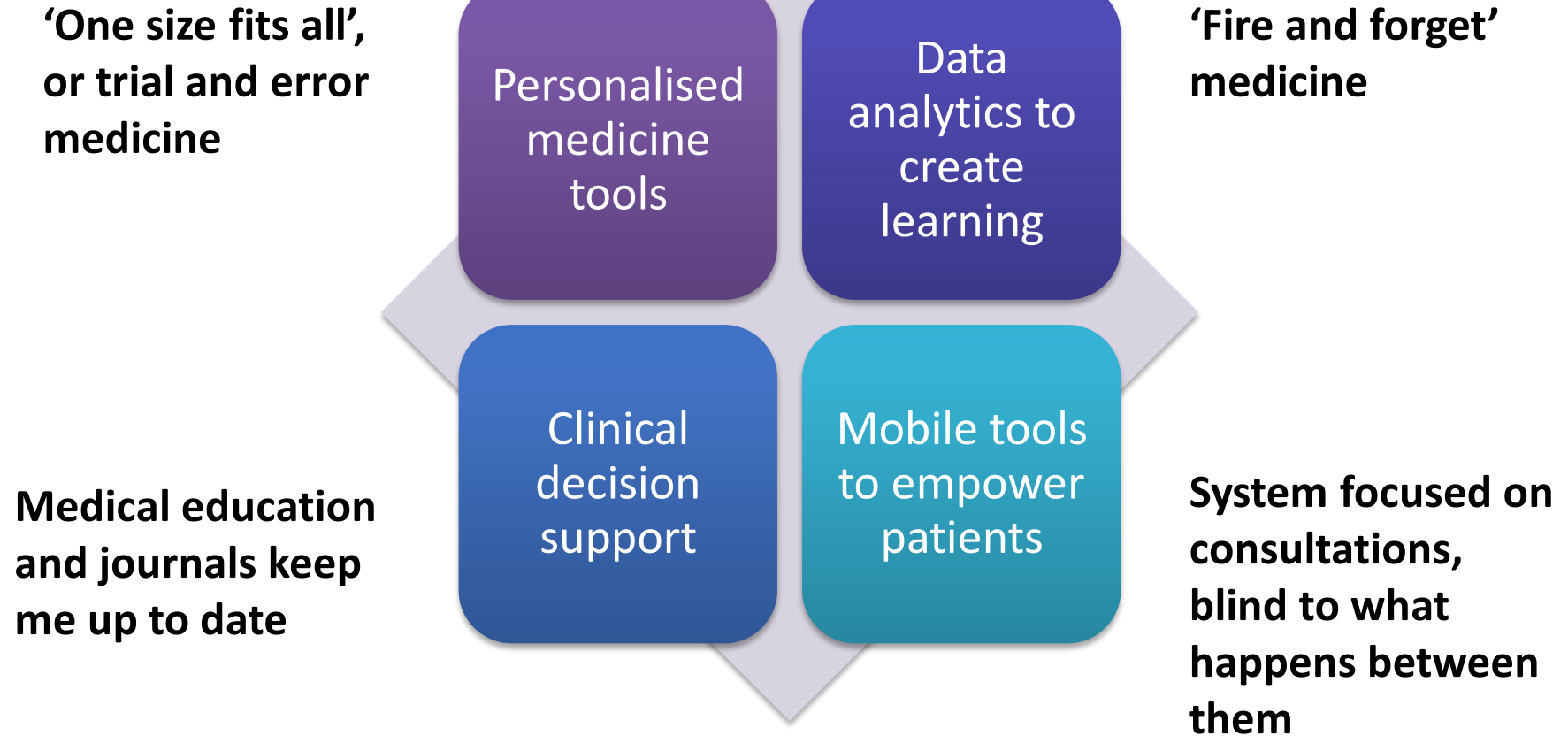
Making healthcare really personal



Focusing on productivity and performance

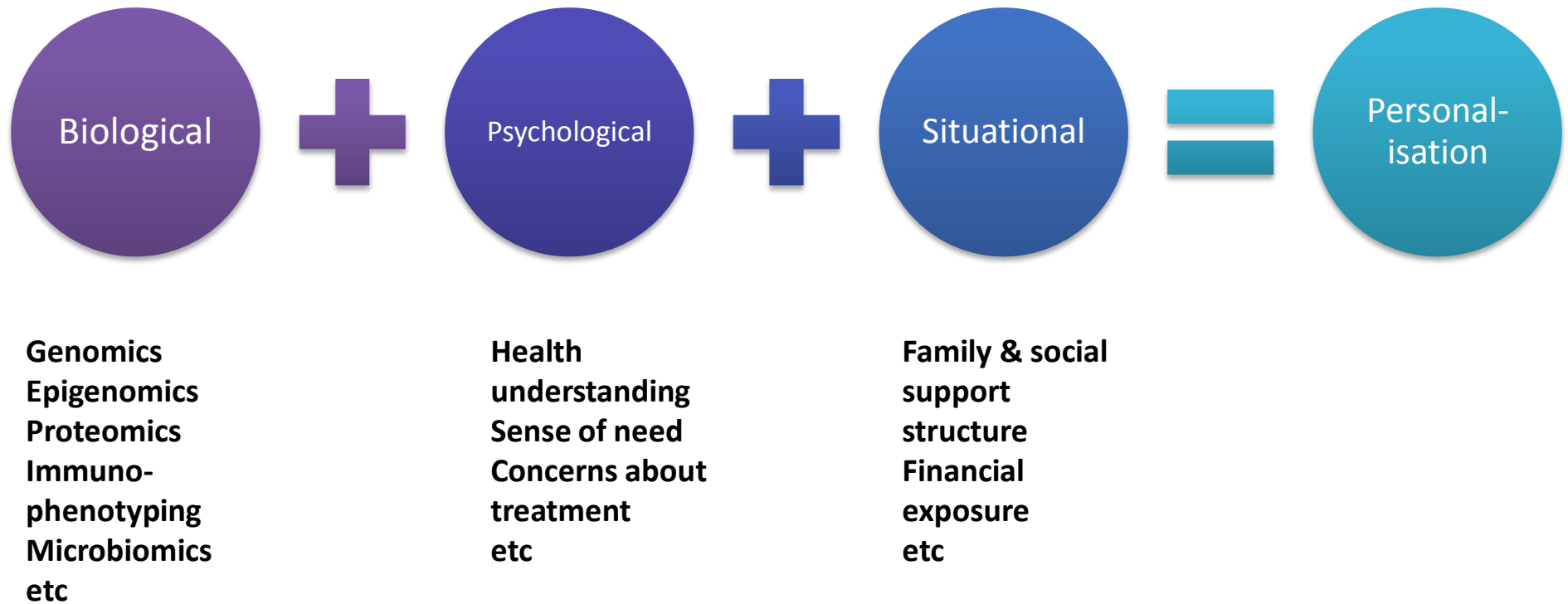
Radically redesigning healthcare delivery

# We have many of the information tools to remake medicine





# Digital health needs to engage with three dimensions of personalisation



# Big data and data analytics hold real promise

- Beware of the hype – big is not necessarily beautiful
- But big data can generate sharp insights
- The result could be acceleration of innovation
- And also ‘discovery’ of the means to prevent or delay disease

# Big is not necessarily beautiful



# But big is sometimes needed to achieve the challenging



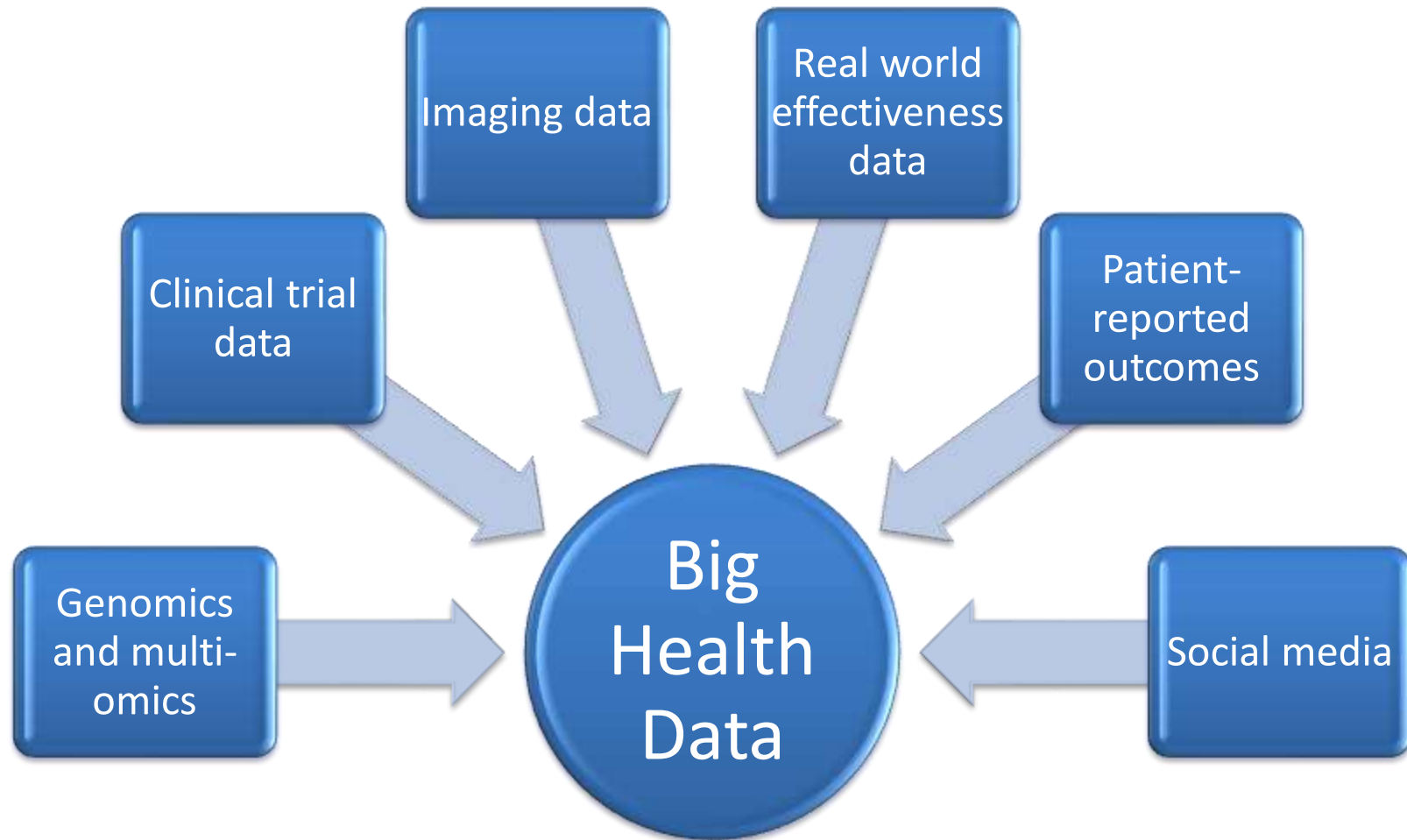
Many PCs have 500GB of data storage – enough for the full genome sequence of 650 people

Entire UK population's genome would require 46 petabytes – the amount of information Google processes every 2 days

Facebook is the fourth most important source of health information for UK citizens

Facebook stores 600 terabytes of data a day

# Multiple, diverse, uncoordinated data sources



## Retrieval and analysis, not storage is the problem

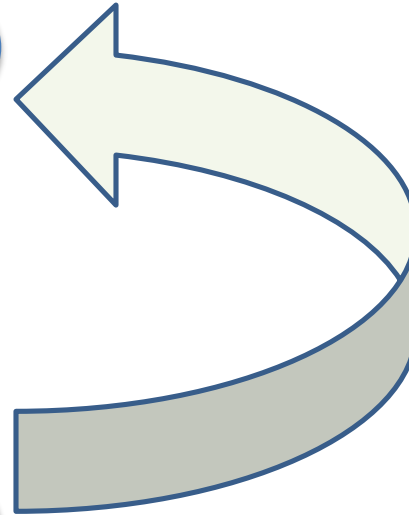
In health insights, small is beautiful – specific effects, specific interventions

In data, size matters

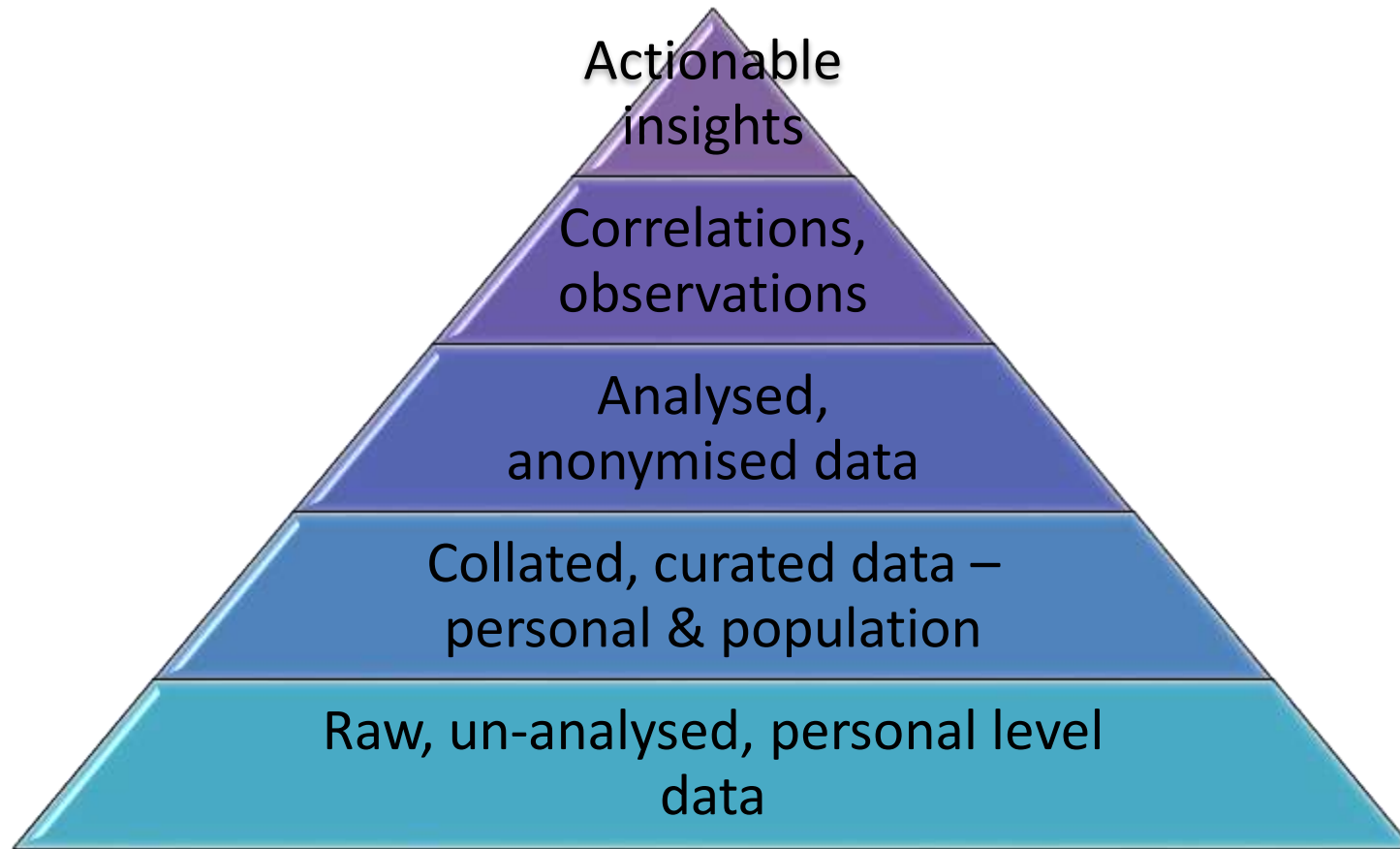
Every drug taken is part of a global clinical trial

Open knowledge ecosystem

Every life is an uncontrolled, poorly documented experiment



# From raw data to actionable insights

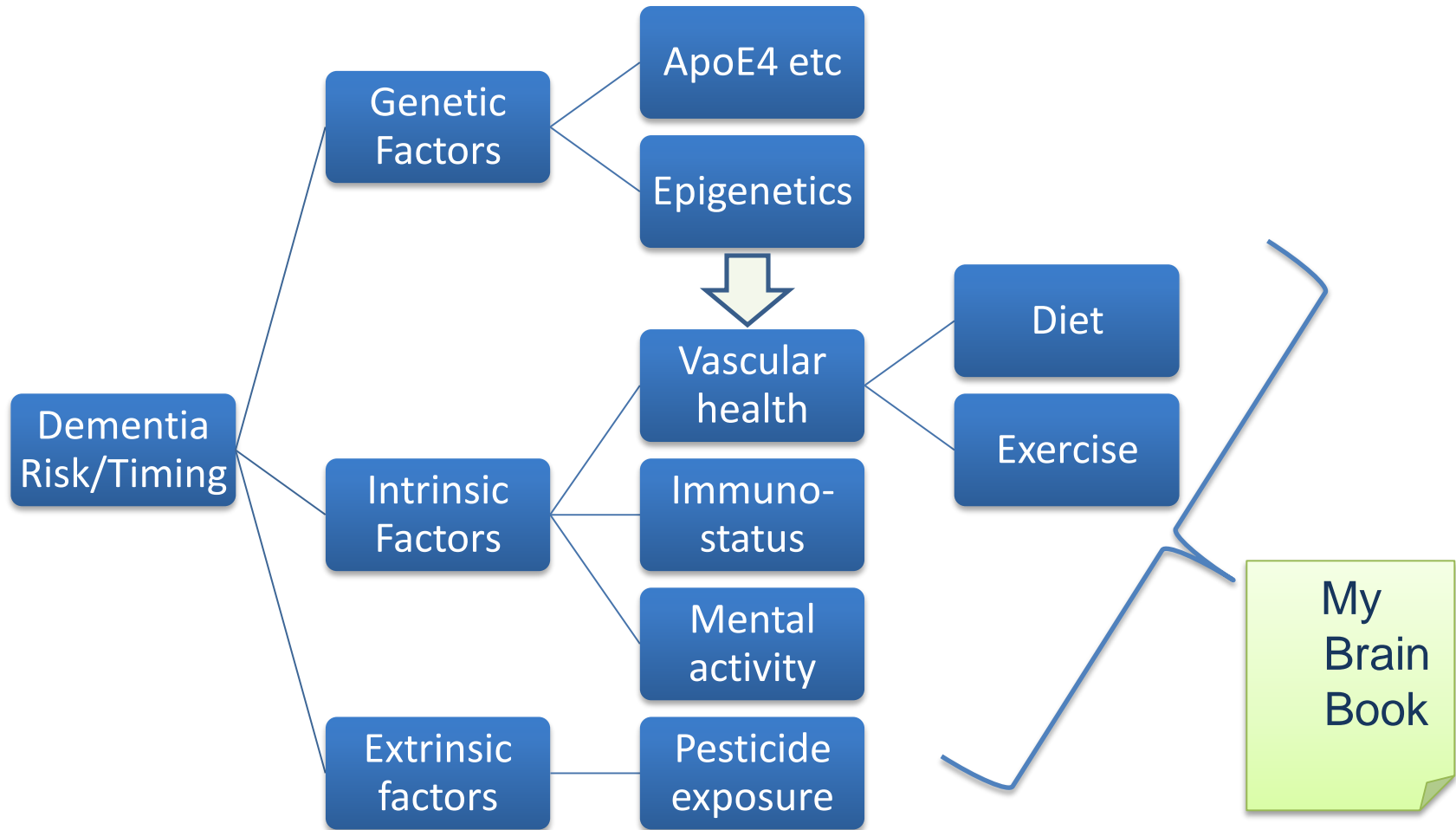


## Some current UK 'big health data' initiatives:

- The UK Biobank – 500,000 subjects enrolled at ages 40-69, biophysical measures, DNA, disease development, drugs taken etc
- The UK Phenome Centre – 100,000 blood + urine samples: lifestyle and environmental factors affecting metabolomics
- The 100k Genome Project – whole genome sequencing of 100,000 cancer/rare disease patients, plus some pathogens



# Dementia – a case example



# Underlying problems for biopharmaceutical innovation

- Tougher diseases
- Escalating R&D costs
- Partial response
- Increasing attrition
- Disputed value
- Slow adoption
- Poor adherence

If we defined diseases by underlying molecular mechanisms, stratified patients using specific biomarkers and designed drugs to match the mechanisms at work in specific patients groups, could we transform productivity?

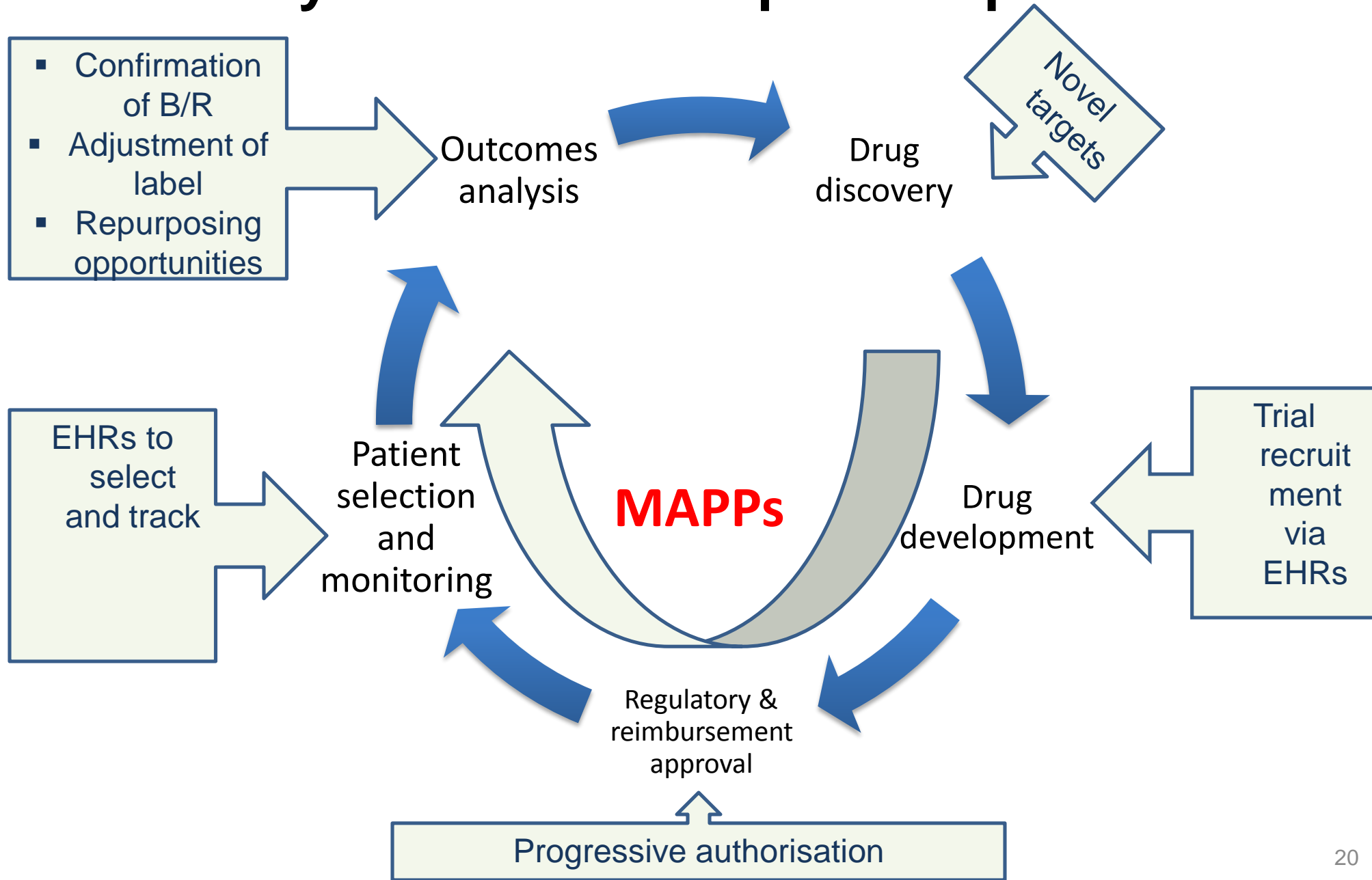
# Underlying problems for biopharmaceutical innovation – and potential of personalised medicine

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Predictive biomarkers  
Stratified populations  
Targeted trials  
Adaptive licensing  
Real world effectiveness & safety data  
More convincing value arguments  
Personalised therapy plans  
Repurposed drugs

# Data analytics and the biopharma process



# Medicines Adaptive Pathways for Patients (MAPPs)

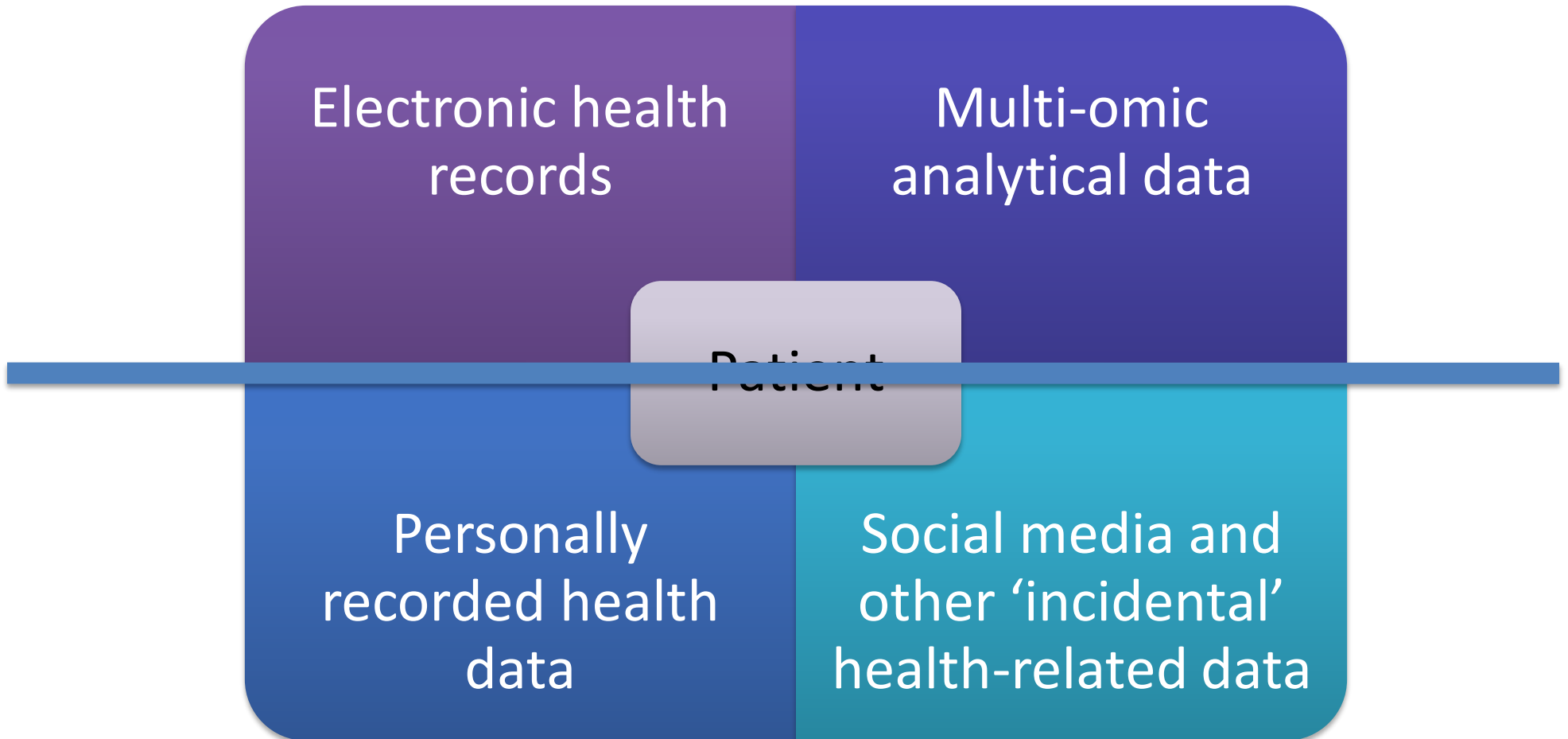
- Collaborative design of evidence generation plan for high potential medicines
- Stratification of patient population using biomarkers
- Selection of likely highest benefit/risk patients
- Early, conditional approval if Phase 2 data shows that B/R meets threshold
- Collection of safety, effectiveness and value information via real world data
- Adaptive approach to reimbursement based on accumulation of value data
- Wider approval to additional patient populations once greater confidence gained

# 'Wicked issues'

## Issues

- Data privacy and confidentiality
- Gaps between professional and personal health data
- Concern about private sector profiting
- Restrictions on data sharing
- Cross-cultural mistrust between academics, industry and health systems

# The two disconnected data domains



# Key issues

## Issues

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## Possible principles/solutions

- Pseudonymisation as data leaves health system
- Patient-centred and patient-driven data integration
- Partnerships with patient organisations
- Query-able federated databases
- Grand challenges that can only be solved by collaboration



# Recap

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