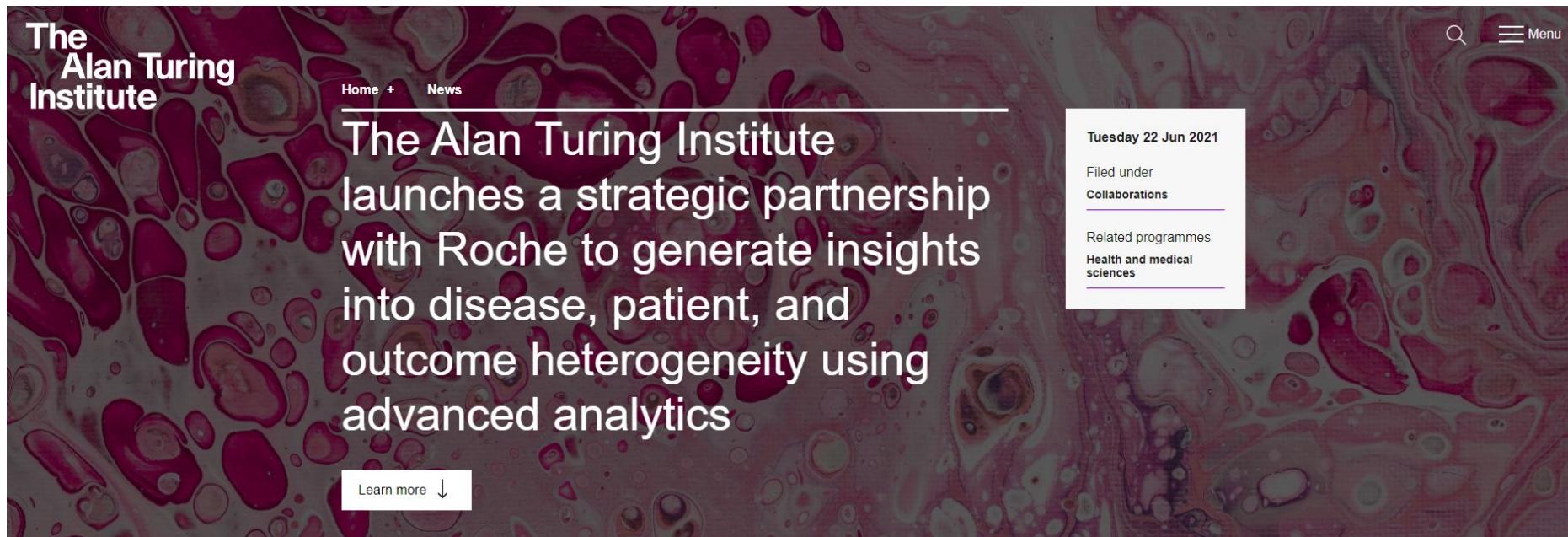

Roche-Turing Strategic Partnership

Community Awareness Presentation

July 12th, 2021



A Recent Announcement



The Alan Turing Institute

Home + News

The Alan Turing Institute launches a strategic partnership with Roche to generate insights into disease, patient, and outcome heterogeneity using advanced analytics

[Learn more ↓](#)

Tuesday 22 Jun 2021

Filed under

Collaborations

Related programmes

Health and medical sciences

The Partnership Team



Professor Chris Holmes
Programme Director for the
Turing's Health & Medical
Sciences Programme



Professor Ben MacArthur
Deputy Programme Director for
the Turing's Health & Medical
Sciences Programme



Katrina Payne
Turing Partnerships
Development Lead



Ryan Copping
Roche
Global Head of Data Science
Acceleration, Product Development



Chris Harbron
Roche
Expert Statistical Scientist &
Advanced Analytics Lead



Nadia Haque
Roche
Senior Director,
PHC Partnering

Our Agenda

An Introduction To Roche, its Research, and its Data

Roche-Turing Collaborative Partnership :
Our Ambitions & How it Will Work

Opportunities to get Involved

The Roche Group

A leading healthcare company dedicated to innovation in a sustainable way

1896

Founded in Basel
Family still holds
majority stake



Lasting

>30 medicines
on World Health
Organization List of
Essential Medicines



#1

R&D investor in
healthcare



58.3 bn

Sales 2020
(CHF)



101'465

Employees worldwide

28,900,000

people treated
worldwide with our
medicines in 2020



... and Sustainable

Among top companies in **Dow Jones
Sustainability Index (Life Sciences
Sector)** for **11 consecutive years**

37

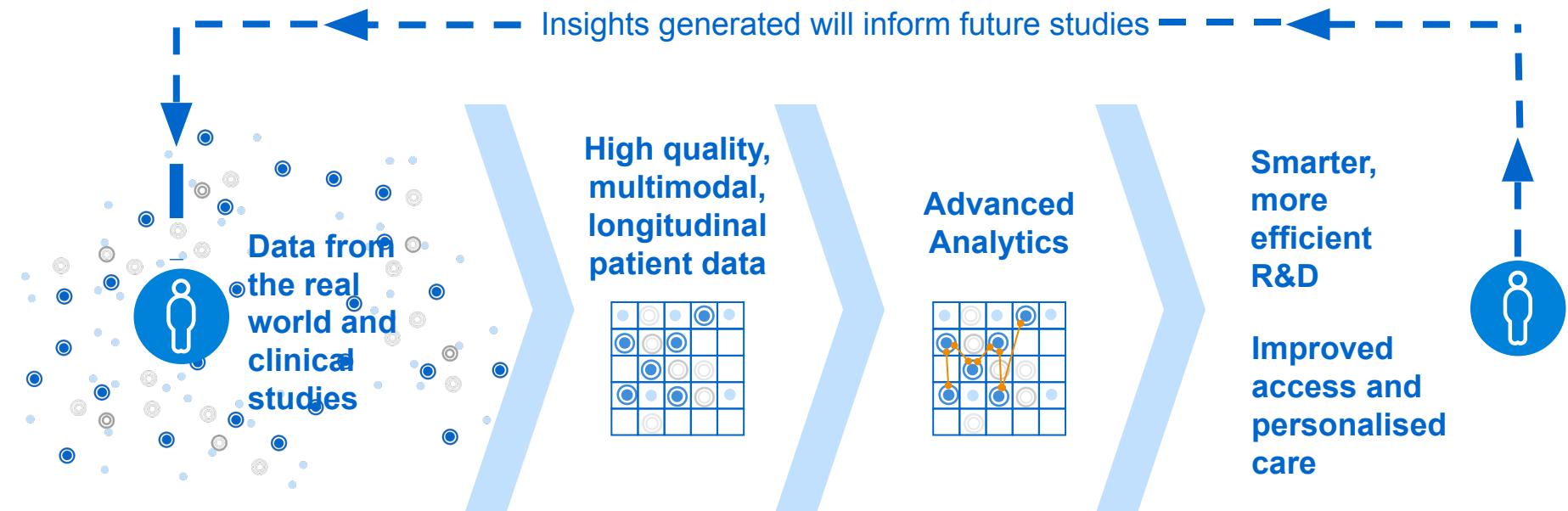
FDA Breakthrough
Designations

¹ Genentech became a full member of the Roche group in March 2009



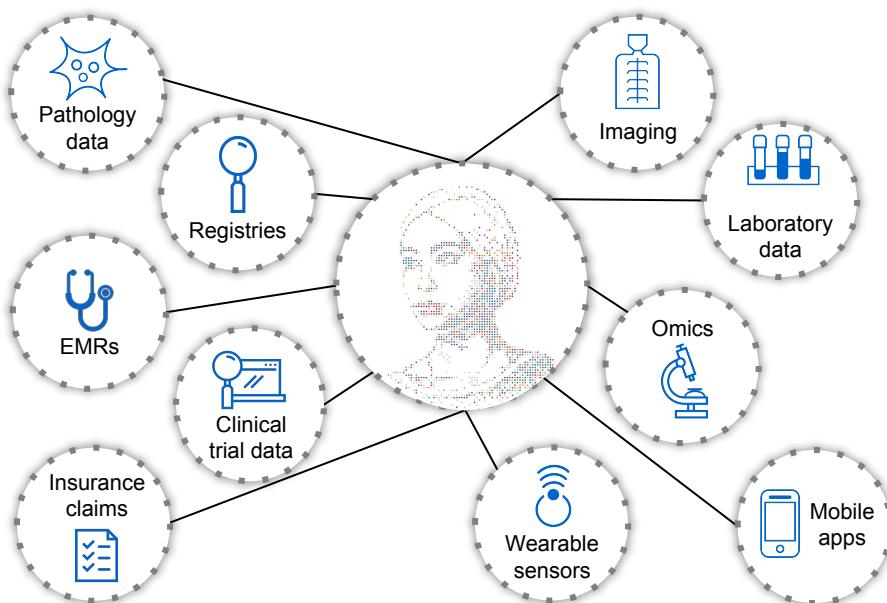
Personalised healthcare means better health, at a lower cost, for people and society. It means shifting from a one-size-fits-all approach to the best care for each person.

Data & Advanced Analytics (AA) are key enablers to transform healthcare



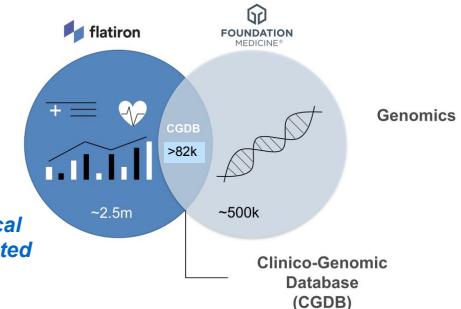
***Focus:** Applying advanced analytics will enable understanding of patient and disease heterogeneity and its relevance to clinical outcomes at an unprecedented resolution*

Roche is integrating high quality, longitudinal, multimodal healthcare data



Examples:

1) Multiple leading research grade Real World Data (RWD) assets, including CGDB



2) Data from >220k patients from our clinical trials (& some observational cohorts) curated into disease area data marts



Enhanced Data and Insights Sharing (EDIS)

Transforming culture & technology infrastructure to generate disease-specific datamarts and share across physical and organisation limits



Making data F.A.I.R Findable. Accessible. Interoperable. Reusable.¹

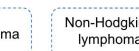
Broader and purposeful availability of aggregated data to accelerate insights generation



Cancer
immunotherapy



Autism
spectrum
disorder



Non-Hodgkin's
lymphoma



Alzheimer's
Disease



Triple Negative
Breast Cancer

This will enable a deeper understanding of each patient and their disease

Our AA capability building efforts have two main areas of focus

Internal focus

Roche Advanced Analytics Network (RAAN)

Key objectives:

- Connecting & empowering the Roche AA community
- Fostering knowledge, sharing & developing AA expertise
- Build foundational AA capability in emerging business areas
- Impacting our research, business and patients by creating key insights from data

External focus

Academic Collaborations

Key objectives:

- To rapidly evaluate and integrate emerging AA methodologies & approaches into our work through collaborations with leading academic institutions
- Increase scientific credibility

Our ambition is to be the leader in advanced analytics in pharma by harnessing internal talent and establishing the most seamless industry and academia collaborations



Advancing
research



Strengthening
internal capabilities



Building Roche's
Advanced Analytics brand

We have established Academic collaborations in the US & EU



Advancing
research



Strengthening
internal capabilities



Building the Roche
Advanced Analytics brand



30 internships and
PhD studentships
in past year

7 leading academics
make up our **Advanced
Analytics Expert Panel**

12 Advanced Analytics
capstone research
projects underway

2 Strategic AA
partnerships with
leading institutions



Rob
Tibshirani



Bin Yu



Daniel
Rubin



Noah
Simon



Balasubramanian
Narasimhan



Chris
Holmes



James
Zou

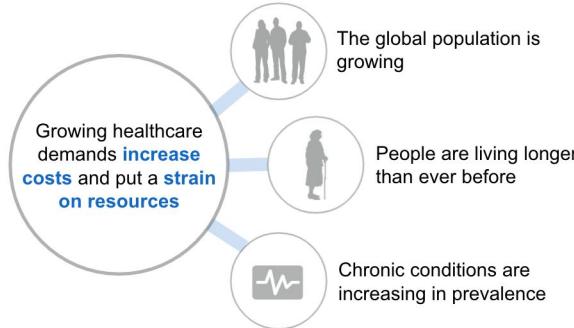
Stanford |
ENGINEERING | AI for Health

The
Alan Turing
Institute

Roche-Turing Collaborative Research Partnership

Difficult challenges need to be overcome in healthcare

The current course of healthcare is unsustainable



Clinical decision making is becoming more complex



- More than 12 000 clinical trials were initiated in Europe in 2019

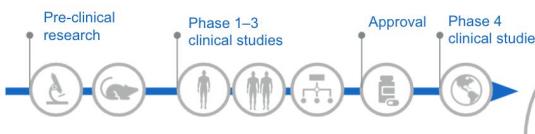
- More than 6000 clinical practice guidelines have been published on PubMed since 2015

- Increasing volumes of heterogeneous healthcare data exist for each patient



Clinical decisions are becoming more challenging for clinicians

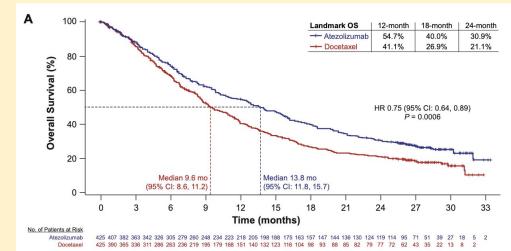
Developing new medicines is a lengthy process



Robust evidence is needed to support the development of new medicines – generating this evidence takes **time** and **money**

Bringing a new treatment to market costs an estimated **1.3 billion USD** in R&D costs and requires **8.3 years** worth of study data

Diagnoses are made using incomplete data, and variations in response to treatments are not always well understood. Issues are compounded when multiple diseases are treated



Roche - Turing Partnership Journey

Identified potential value from collaborating

Demonstrated collaboration could work

Figured out practical details of how partnership works

Initiate projects!

2019

Spring

Data Study Group

2019

Autumn

Collaborative Project

2020

from January

Planning Partnership

2021

June

Strategic Partnership Announced



The
Alan Turing
Institute

Roche Collaboration
Exploration and Prediction of
Advanced Non-Small-Cell
Lung Cancer

CONFIDENTIAL

MASTER COLLABORATION AGREEMENT

THIS MASTER COLLABORATION AGREEMENT (this "Master Agreement") is dated and effective as of [•], 2020 (the "Effective Date") and is entered into by and between F. Hoffmann-La Roche Ltd ("ROCHE") (its registered office is at Grenzacherstrasse 124, 4056 Basel, Switzerland ("ROCHE")) and The Alan Turing Institute, a company registered in England and Wales (company registration number: 09512457) and a charity registered in England and Wales (charity number 1162533) whose registered office is at The British Library, 96 Euston Road, London NW1 2DB, UK (the "INSTITUTE").

ROCHE and INSTITUTE are each referred to herein individually as a "Party" and collectively as the "Parties".



How we can contribute - Our North Star

"To enable the generation of insights to better understand patient and disease heterogeneity and its relevance to clinical outcomes at an unprecedented level of precision in order to improve clinical care"

Our Symbiotic Relationship

By bringing together complementary expertise and viewpoints from industry and academia we are well positioned to make scientific breakthroughs over time in this very challenging space



Synergistic skills &
perspectives:
combine rigour with agility

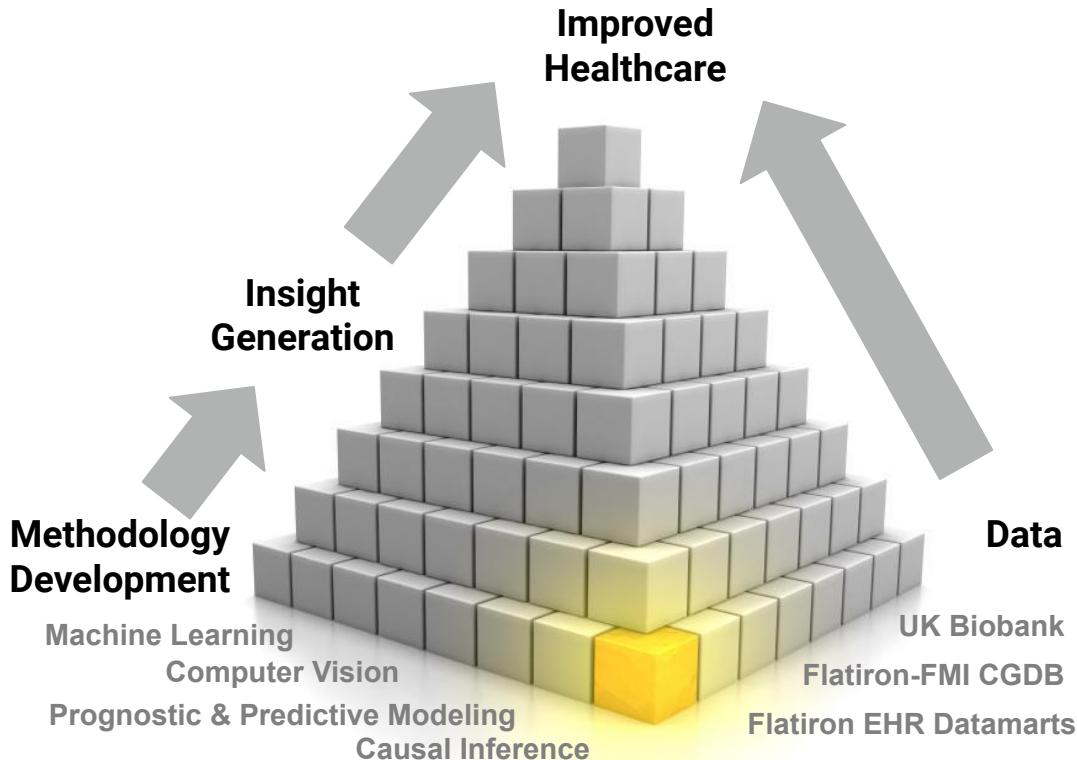


A common goal & north star to
tackle an important problem



We have the passion & capabilities
to partner together to address
challenges and unlock solutions

We will take an iterative, stepwise approach to tackle this grand challenge



We will tackle underlying methodological challenges to address and utilise our complex data sources and unlock important use cases

We will take data and expertise from across the Turing and Roche organisations

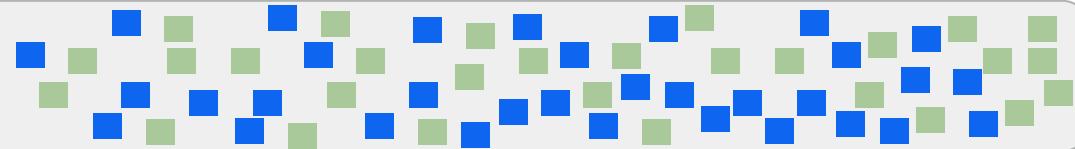
We will iteratively build upon our learnings in a series of methodological projects

Roche-Turing Partnership Objectives

-  **Generate insight and impact** by applying the latest leading-edge research in advanced analytics to data from observational studies, clinical trials, non-interventional studies and publicly available datasets within goal-focused practical challenges
-  Use **knowledge gained** from applications to identify methodological gaps, generating a virtuous cycle and a driver for **further fundamental research**
-  Help Roche to **maximise patient impact** from its investment in a wide range of data sources and technologies, in multiple therapeutic areas, including oncology and neuroscience
-  Allow Roche to **engage with cutting edge expertise** from across Turing's network of partner universities
-  **Participate in Turing's data-centric place within the UK Health ecosystem**, including regulation, health data curation, talent development, fundamental and translational research focused on grand challenges, data ethics considerations, tools, practices, systems and industry-wide standards
-  **Further open science** and its application through the publication of joint academic papers and thought pieces, workshops and events, & potentially pre-competitive publication of code under permissive open source licenses
-  **Foster innovation** by bringing together talented researchers with diverse experience & ideas

Partnership : Idea & Project Flow Over Time

Roche & Turing
Idea Generation



Constant flow of ideas from research and business challenges and methodological developments across application areas and business functions

Cross functional
internal brainstorming

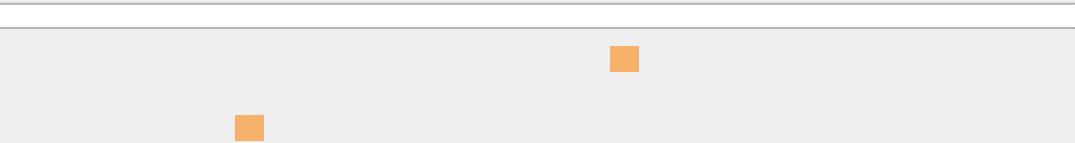


Joint Brainstorming
Group



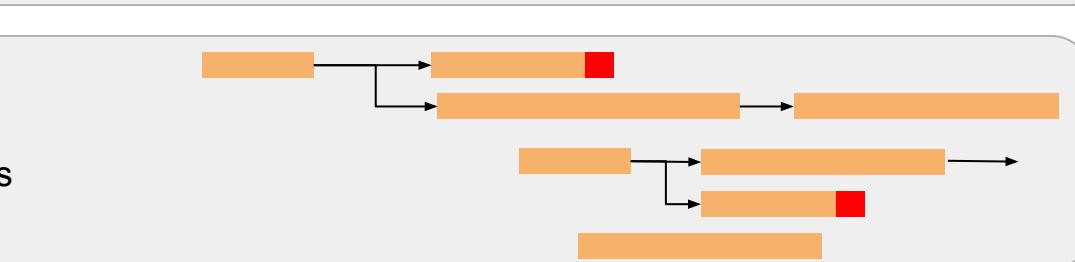
Joint Brainstorming Group further develops ideas and identifies synergies

Joint Steering
Committee



Joint Steering Committee identifies projects to progress ideas

On-Going
Collaborative Projects



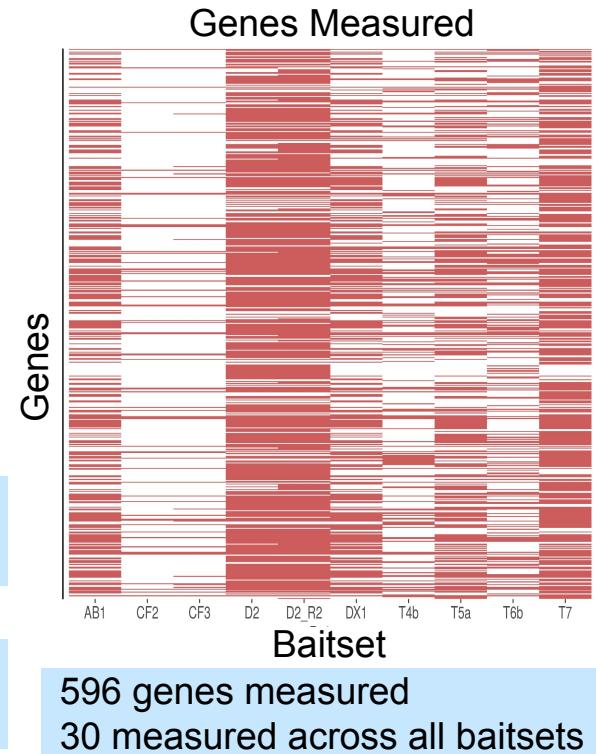
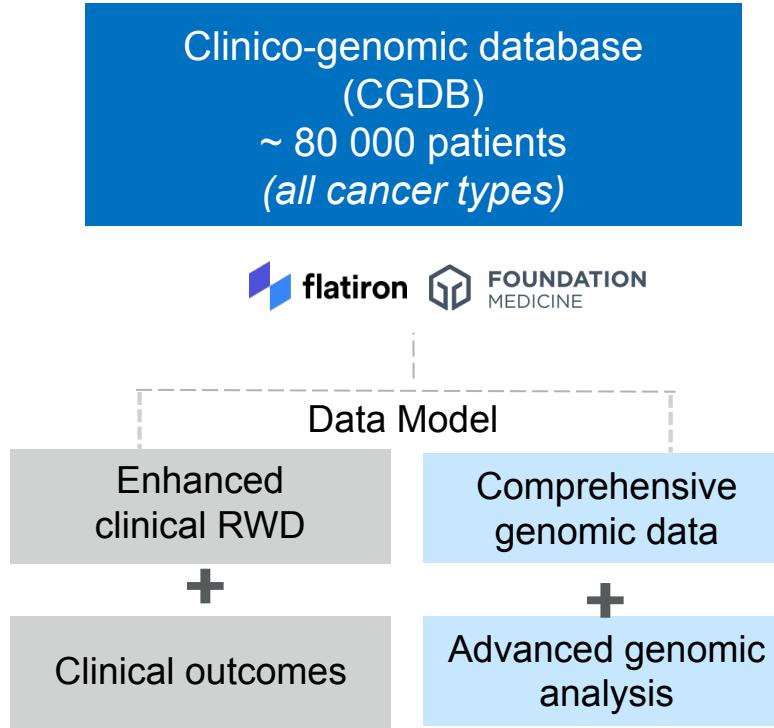
Projects may be smaller learning / feasibility or larger Projects may spawn follow-on projects Quick kill and pivot for unfruitful lines of research

Initial Project Theme

Structured Missingness using CGDB as Motivation

Missing Data is a ubiquitous challenge across healthcare data, which compromises our ability to learn from data. This issue is exacerbated by structure in the missing values.

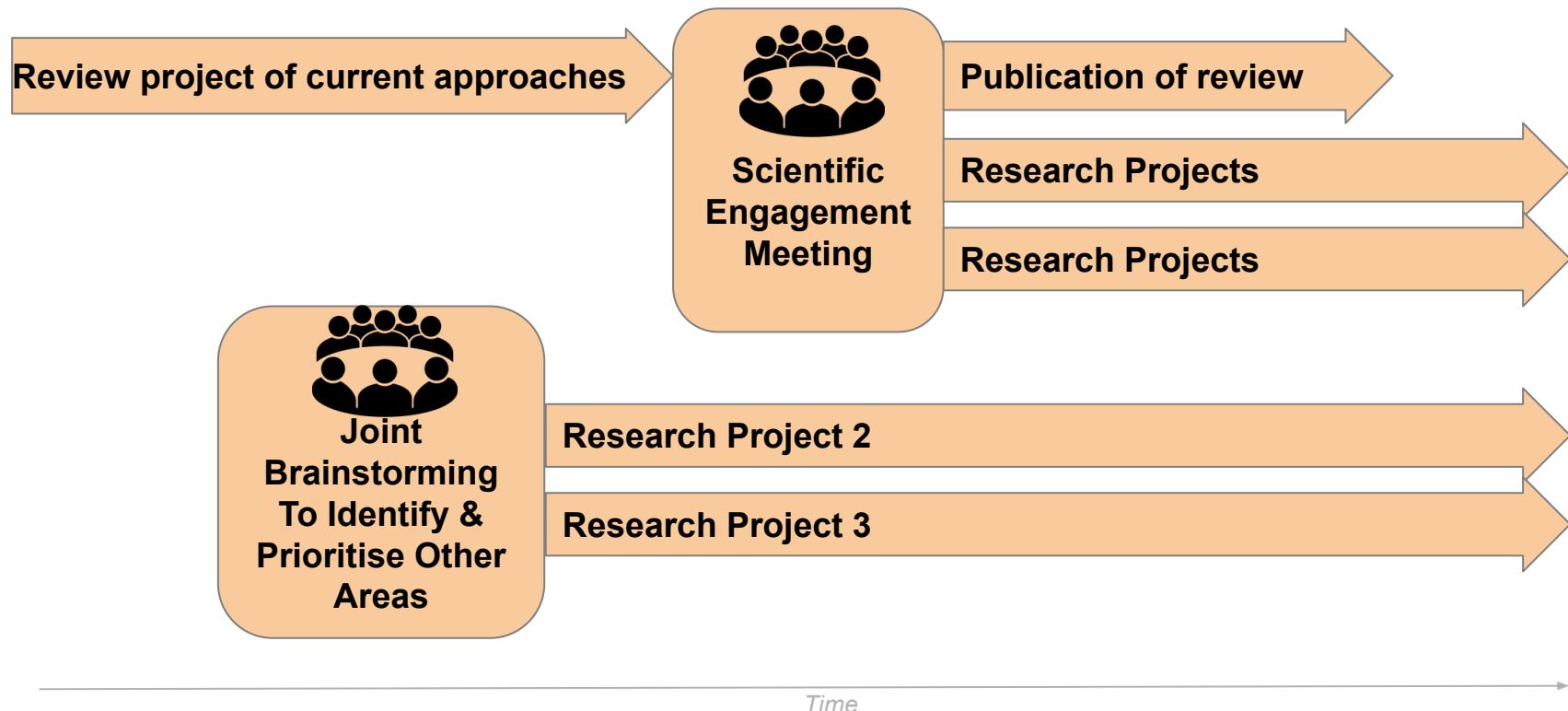
To make the most of data resources we need new methods to handle structured missingness, tailored to the particular challenges of healthcare data.



This is an essential building block which will be required across many different AA healthcare applications

Initial Project Theme

Structured Missingness using CGDB as Motivation



Potential Project Topics

Methodology

Prognostic / Predictive Modelling - Wisdom Of Crowds

Policy

Validation of Prognostic / Predictive Models

Methodology

Differential missing patterns in data sources

Methodology

Digital Twins

Methodology

External Controls

Methodology

Delayed Study Entry

Methodology

Prognostic / Predictive Modelling - Block Missingness

Methodology

Robustness to variations in input data?

Methodology

Federated Computing

Methodology

Prognostic / Predictive Modelling - Health Status Metric

Methodology

Imaging

Methodology

Realistic estimates of prediction uncertainty

Methodology

Library of Synthetic Simulated Datasets

Applications

Wearable Devices / Phone Apps

Methodology

Knowledge Graphs

Policy

Data Sharing - Cultural Attitudes and Practical Issues

Methodology

NLP

Policy

Data Sharing and Privacy

Opportunities To Get Involved

Two roles currently being advertised

See www.turing.ac.uk/work-turing/jobs for more details

Closing Date
July 21st

Research Lead, Turing-Roche Partnership

Alan Turing Institute

London United Kingdom

Research Programmes

Share



Apply

Community Manager, Turing-Roche Partnership

Alan Turing Institute

London United Kingdom

Research Programmes

Share



Apply

Upcoming Event

2021

Autumn

Structured Missingness Scientific Engagement & Co-Development Event

Objective : To co-design a research programme in the area of structured missingness for subsequent funding through the partnership

Format : Three sessions over a 2-4 week period

Attendees : Applications to be invited soon

Opportunities

Moving forwards there will be regular opportunities to engage with the partnership, for example :



Projects looking for **leads or researchers**



Workshops to shape the direction of a research theme and identify projects



Brainstorming events to share experiences or ideas



Look out for these being advertised through various channels such as The Turing Health Programme newsletter, Turing's slack channels #health & #interestingevents

All contributing to our North Star :

To enable the generation of insights to better understand patient and disease heterogeneity and its relevance to clinical outcomes at an unprecedented level of precision in order to improve clinical care



Any Questions

Doing now what patients need next

Opportunities & Challenges



Data Volume, depth, quality

Access to wide diversity of data sources from both parties

Avoiding data being the bottleneck

Is available data enough?

Addressing inherent challenges/biases

Being mindful of data sharing constraints and opportunities



Open Science

Jointly building exciting science together

Awareness of two different cultures here: academic commitment to open science, balanced against IP concerns

Maintain Turing motivation by ensuring freedom to publish



Working across communities

Wide and diverse set of talent and experiences across the two partners

How to make the best of both communities by tapping into the full available expertise



Prioritisation

Agile operating model and abundance of questions

Without pre-set deliverables, how to triage and select what to take on

Executive Summary

- Roche & Turing have signed a **5 year strategic partnership** deal ([link](#) to Turing press release)
 - **Focus:** developing advanced analytics (AA) methodologies to enable the generation of insights to better understand disease, patient and outcome heterogeneity
 - **Background:** builds on 2 years of close collaboration between Roch & Turing Data Scientists
 - **Scope:** Will primarily focus on open source research to enable Roche's PHC vision but is considered an enterprise wide asset (representation from each major Roche division)
- ***The Opportunity:***
 - Leverage collaboration to address Roche's AA research agenda → Downstream **impact**
 - Ability to quickly tap into external AA **innovation** & network of **experts**
 - Build **talent pipeline** & leverage top academic talent as an extension of our in-house team
 - Helps to shape the healthcare **ecosystem** in AA space

Potential Project Topics

Methodology

Prognostic / Predictive Modelling - Wisdom Of Crowds

Policy

Validation of Prognostic / Predictive Models

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Applications

Wearable Devices / Phone Apps

Methodology

Knowledge Graphs

Policy

Data Sharing - Cultural Attitudes and Practical Issues

Methodology

NLP

Policy

Data Sharing and Privacy

Quickfire introductions

In one sentence please share: **What excites you about our partnership?**

Partnership Core Team



Professor Chris Holmes
Programme Director for the Turing's
Health & Medical Sciences Programme



Katrina Payne
Turing Partnerships
Development Lead



Professor Ben MacArthur
Deputy Programme Director for the
Turing's Health & Medical Sciences
Programme



Ryan Copping
Roche
Global Head of Data Science
Acceleration, Product Development



Jackie Gannon
Roche
PHC Business Operations Leader



Nadia Haque
Roche
Senior Director, PHC Partnering



Chris Harbron
Roche
Expert Statistical Scientist



Baroness Nicola Blackwood
Turing Board of Trustees
Chair of Genomics England



Professor Sir Adrian Smith
**Turing Institute Director & Chief
Executive**



Hitesh Thakrar
Turing Board of Trustees
Venture Partner at Syncona
Life Science Fund



Thomas Bengtsson
Roche
Global Head of Personalized
Healthcare Imaging



Levi Garraway
Roche
Chief Medical Officer
Head of Global Product Development



Teresa Graham
Roche
Head of Global Product
Strategy



Jeff Helterbrand
Roche
Global Head of Product
Development Data Sciences



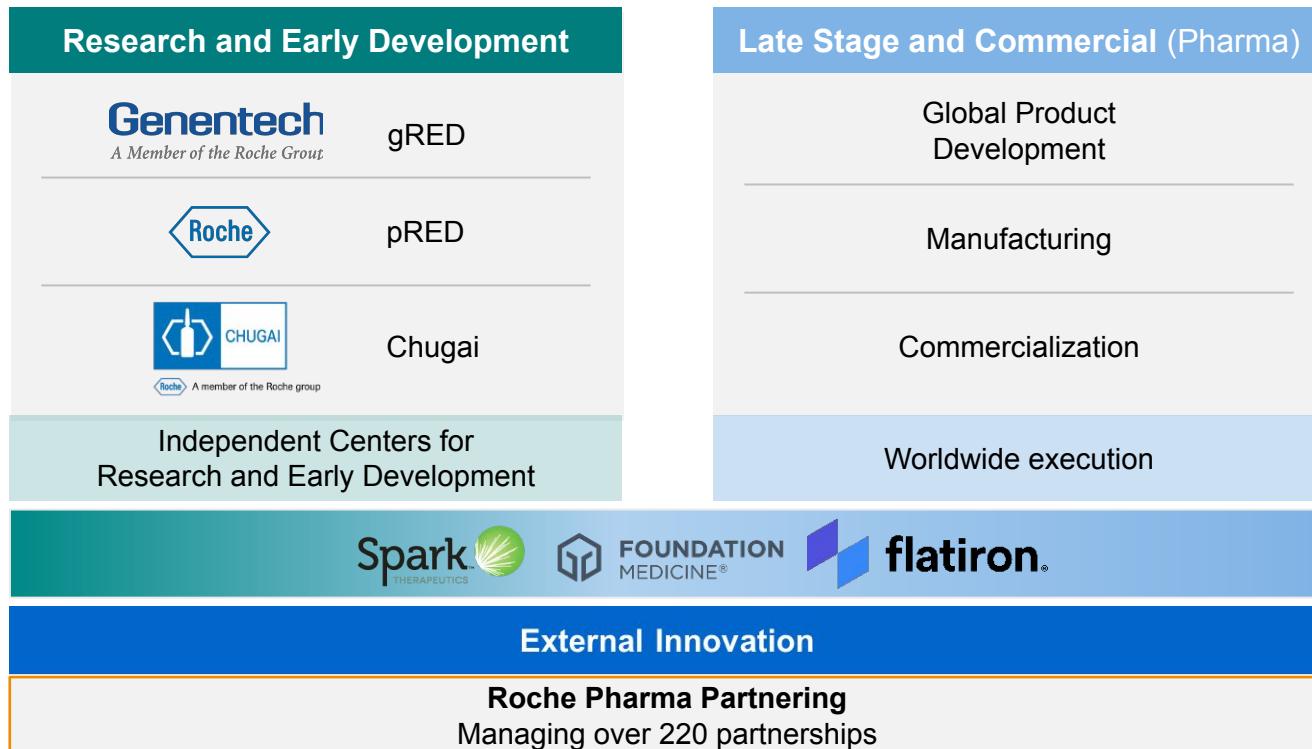
James Musick
Roche
Global Head of Personalized
Healthcare



Aviv Regev
Roche
Global Head of Genentech
Early Research & Development

The Roche innovation model

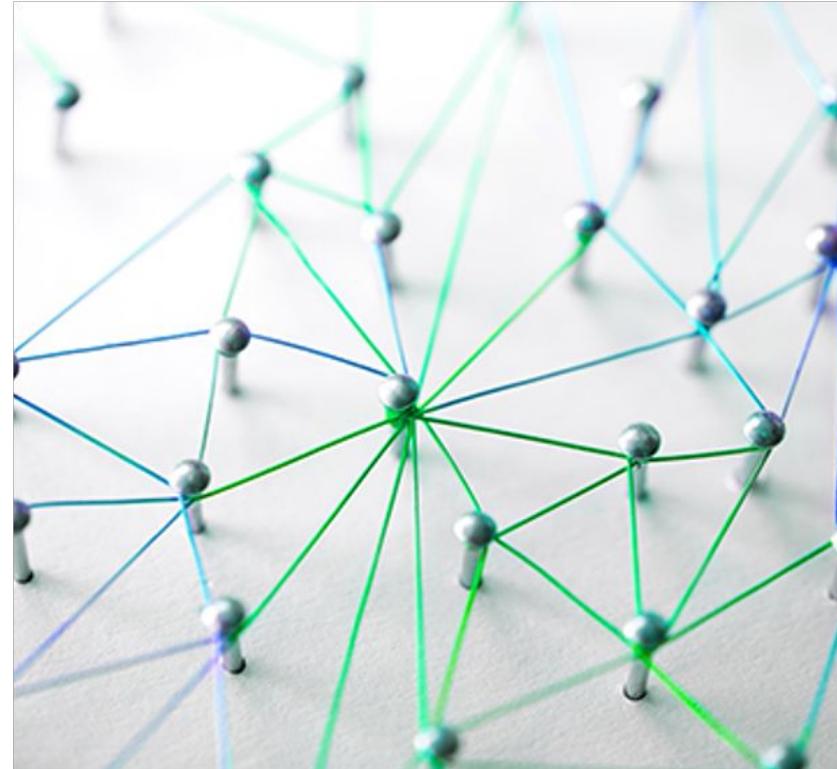
Facilitates scientific freedom to work, think and address problems in different ways



The Alan Turing Institute

The UK's National Institute for Data Science & AI

- A strategic UK Government investment, established to deliver positive social and economic benefits from data science
- Unique position at the interface of academia, business, third sector and policy
- Open and inclusive



Turing's Mission

- **Innovate** and develop world class **foundational research** in data science and AI
- **Apply our research to real-world problems**, supporting the creation of new products, services and jobs
- **Train** the next generation of data science and artificial intelligence leaders
- **Advise policymakers** and **shape the public conversation** around data



Turing Research Programmes

Sector specific



Health and medical sciences



Defence and security



Data science for science



Finance and economics



Data-centric engineering



Urban analytics



Cross-cutting



Public policy



Safe & Ethical AI



Tools, practices and systems



Data science at scale

Our subscribing university partners



THE UNIVERSITY
of EDINBURGH



Turing's strategic partners



..... and some of our Health-related project collaborators

Turing's scientific community

300+ Turing Fellows

10+ Turing Research Fellows

6 Honorary Fellows

60+ PhD students

18 Turing Interns

300+ Visiting Researchers from
academia, industry, govt.

**25+ Research Engineers / Data
Scientists**

(Figures as of June 2021)



Example of Roche's recent data journey

