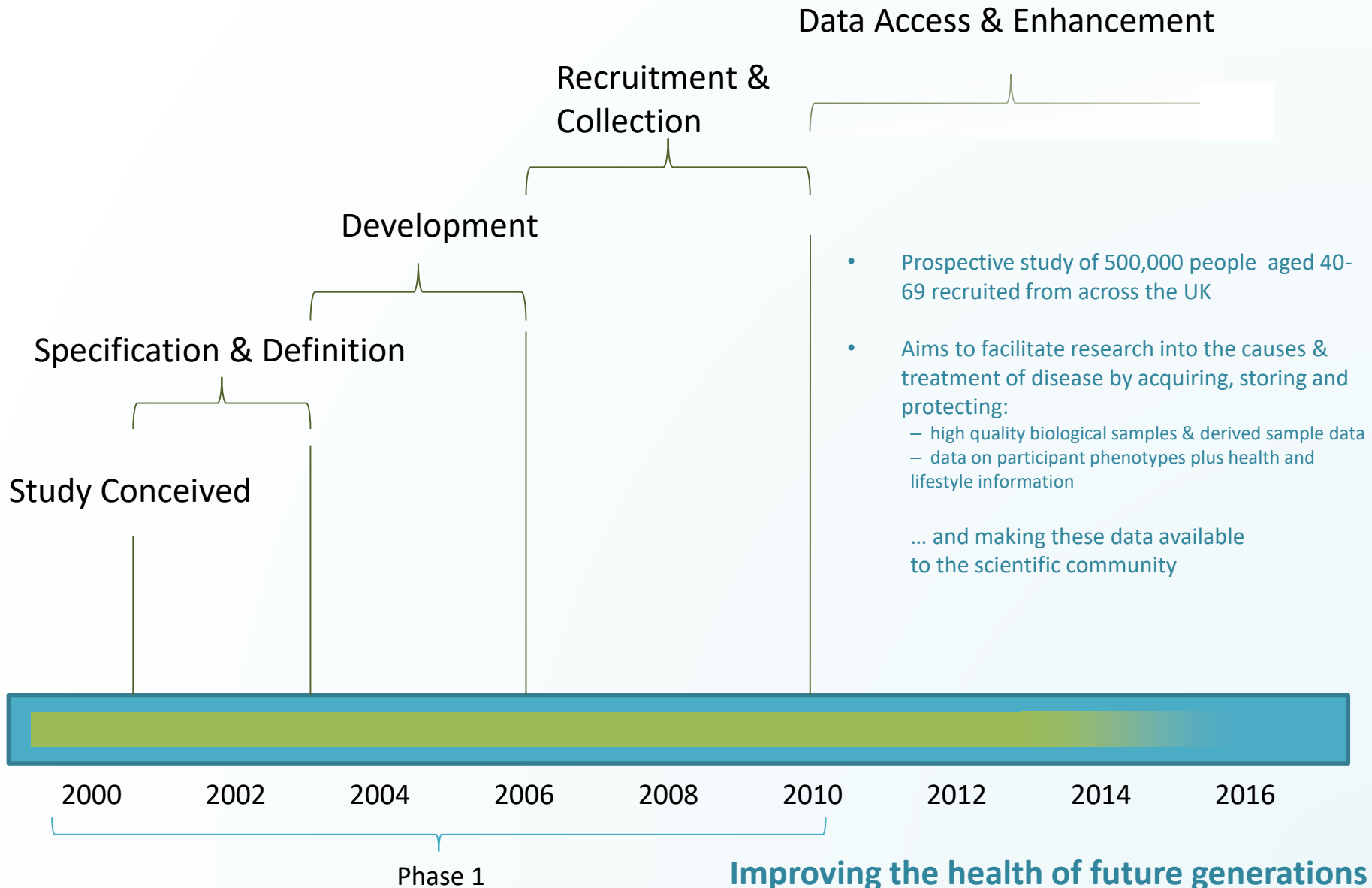
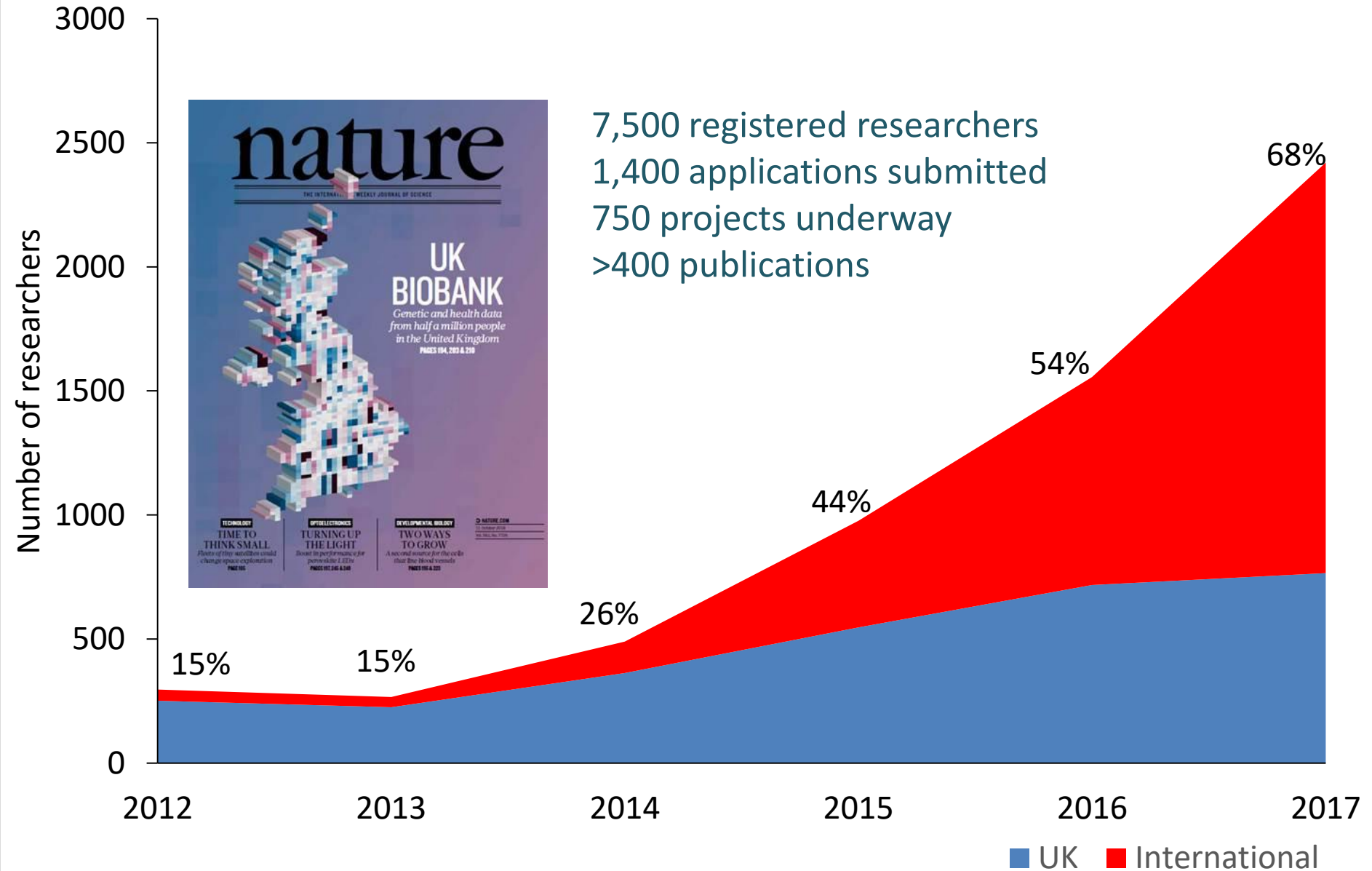




UK Biobank Past, Present, and Future

November 2018





UK Biobank Resource

Record Linkage

Linkage to medical and other health-related records

Adjudication of health outcomes

Repeat measures

Repeat of baseline assessment
(with enhancements)

Baseline data from assessment centres

Questionnaire /
Interview data

Physical
measures

Biological Samples

Enhancements (Further)

Assays

WBQs

Other

Enhancements (In Progress)

Imaging

Biomarkers

AMSR

Enhancements (Complete)

Genotyping

WBQ

Activity

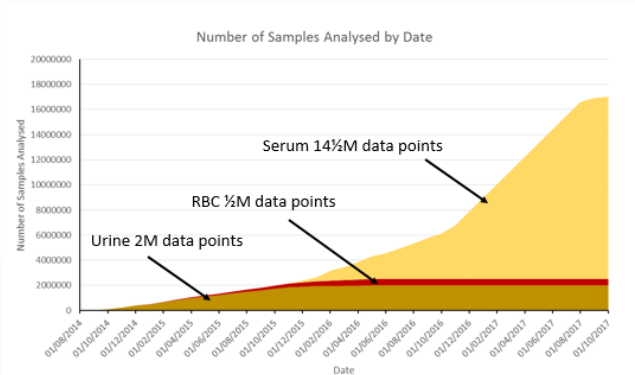
Returned
data from
use of the
resource

UK Biobank Resource - Enhancements (In Progress)



Imaging

- Passed 30,000 participants imaged (October)
- Additional centre to accelerate completion (by end 2022)
- Further 10,000 longitudinal repeats to be included (starting early 2019)



Biomarkers

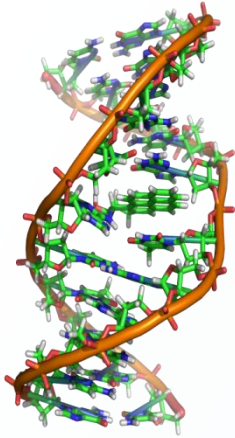
- 34 Biomarkers in Red Blood Cells, Urine & Serum
- Urine data released
- Serum and HbA1c to be released December 2018



Activity Seasonal Repeat

- 100K participants from mid-2013 to mid-2015
- Raw data and summary variables available
- Repeat monitoring looking at seasonal variation
- Aim for ~2000 participants with four complete sets

UK Biobank Resource - Enhancements (In Planning)



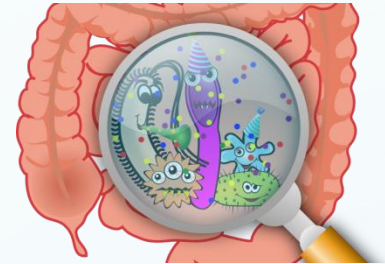
Whole Genome Sequencing

- Vanguard project to sequence 50,000 participants by end 2019
- Vanguard sequencing started in August 2018
- Anticipated main phase protocol to sequence remaining cohort across 3yr period



Web Based Questionnaires

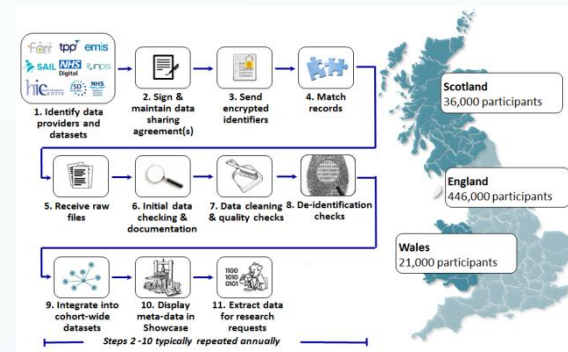
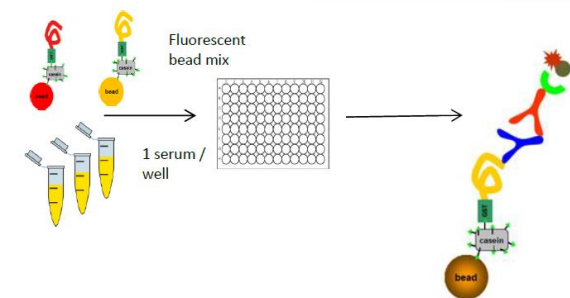
- WBQ for IBS completed – data now available
- Next WBQ focused on Pain (4Q18)
- Pipeline of further WBQ's (two per year): Sleep, Health Aging, Repeat Diet (link to Stool), Family History...



Gut Microbiome

- Stool collection pilot to start shortly
- Assess participant willingness to contribute
- Undertaken review of microbiome assays
- Funding sought for main programme

UK Biobank Resource - Enhancements (cont'd)



Infectious Disease

- Assay of blood borne antibodies as markers of exposure and/or infection
- Pilot concluded – £8.4m funding being sought for a 2019 start
- Investigate association with cancer, CVD, inflammatory diseases

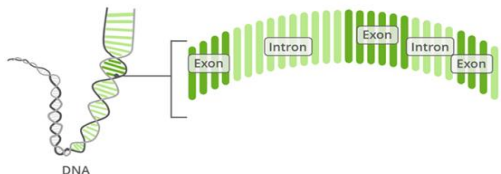
Environmental Monitoring

- Portable monitoring device to capture environmental information such as pollution
- Feasibility study in process of being designed
- Target to add environmental exposure data to the resource

Data Linkage / Outcomes Adjudication

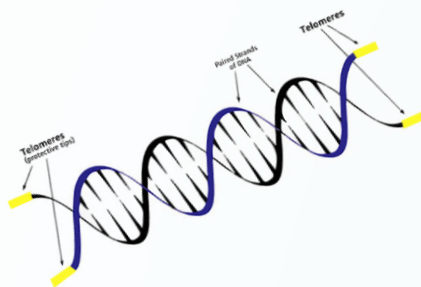
- Further extending linkage to primary care data
- Consideration of additional linked datasets to prioritise
- Developing adjudication algorithms to identify and classify disease

Access Projects (In Progress / In Planning)



Exome Sequencing

- Regeneron/GSK - sequencing 50,000 ppts
- Completion of remaining 450,000 by end 2019



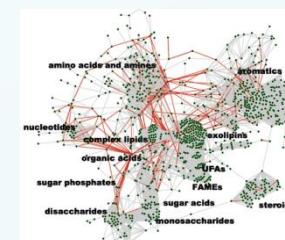
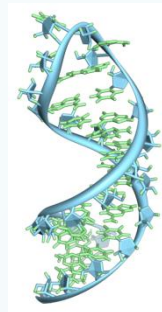
Telomere Length

- Residual DNA from genotyping project to analyse telomere length in all participants
- Includes an assessment of longitudinal change in individuals from baseline visit



Cardiac

- Non-invasive stick-on patch applied in clinic or at home
- Beat-to-beat ECG investigating silent-AF

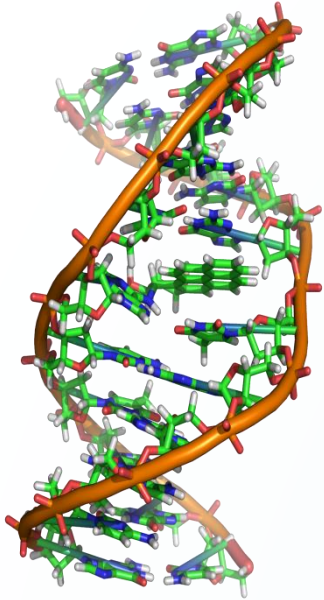


And more..

- e.g. Nightingale/Brainshake NMR metabolomic assay

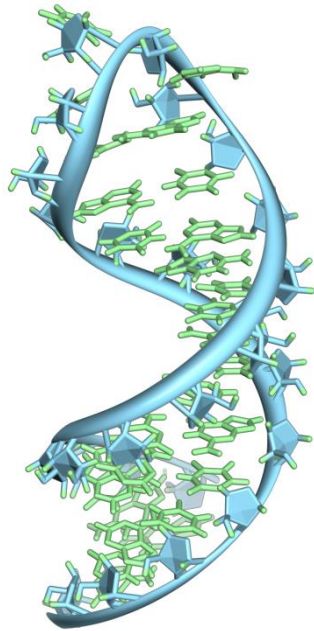
Improving the health of future generations

Futures: Higher Content Analyses



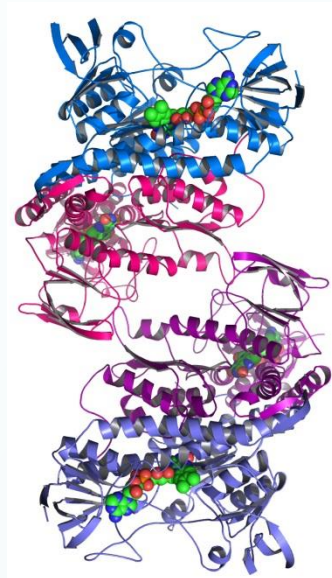
DNA

Genomics



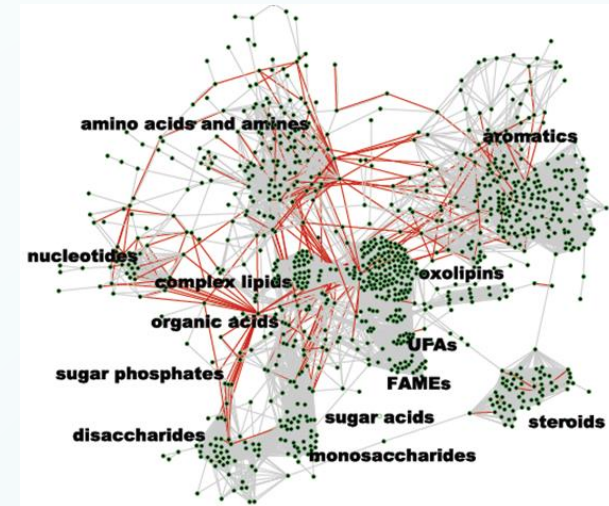
RNA

Transcriptomics



Proteins

Proteomics



Metabolites

Metabolomics

- If UK Biobank performed Whole Genome Sequencing on the whole cohort....
 - 1 Sequence (CRAM File at 30x read) = 50 GB
 - 500,000 participants = circa 30 PBs of data

Improving the health of future generations