UK Biobank: an update for our participants

Prof Cathie Sudlow, Chief Scientist
500,000 participants
22 recruitment centres
89% England
7% Scotland
4% Wales
Participant characteristics

- 46% male
- 57% aged 40-59; 43% aged 60-69
- Less socioeconomically deprived than UK average but all strata represented
- 85% urban
- 94.5% white; 5.5% other ethnicities
Touchscreen station
- Consent
- Questionnaire
- Cognitive function
- Hearing

Interview station
- Interview
- Blood pressure
- Pulse wave velocity

Eye measure station
- Visual acuity
- Refraction
- Intra-ocular pressure
- Retinal imaging

Physical measures station
- Height (standing/sitting)
- Waist/hip circumference
- Weight/impedance
- Hand grip
- Spirometry
- Heel ultrasound

Sample collection stations
- Blood
- Urine
- Saliva

Web-based diet questionnaire
- 24hr dietary recall

Physical fitness station
- Exercise test with ECG

Exit
UK Biobank samples

- 700 Participants per day
- 4,900 Vacutainers per day
- 25,000 aliquots produced per day
- 15 million 0.85ml aliquots
• Blood
  whole blood
  serum
  plasma
  red cells
  buffy coat

• Urine

• Saliva

Total > 15 million aliquots
Follow-up of half a million people….

- COMPREHENSIVE
- SCALABLE
- COST EFFECTIVE

All participants:
- registered with a GP in the NHS
- consented to linkage to health-related records

NHS provides majority of healthcare in UK

National datasets about healthcare & health outcomes exist

….so link to these datasets…..
Follow-up through health records

Key national sources:

- Death registrations ✓
- Cancer registrations ✓
- Hospital episode data ✓
- Primary care data (√)
Follow-up through questionnaires

• Building on the success of the online dietary questionnaire

• To assess outcomes we can’t find out about through linking to health records:
  – Cognitive function
  – Occupation
  – Mental health
  – Quality of life
Collection of seven day physical activity data

Data obtained from 60,000 of a planned 100,000 participants
Analyses of samples underway

• Genotyping of all 500,000 participants
  – To be completed during 2015

• Biomarker measures in all 500,000 participants
  – To be completed during 2016

• Planned panel of infectious biomarkers
# Biomarkers being measured

<table>
<thead>
<tr>
<th>Cardiovascular:</th>
<th>Bone and joint:</th>
<th>Renal:</th>
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<tbody>
<tr>
<td>Cholesterol</td>
<td>Vitamin D</td>
<td>Creatinine</td>
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<tr>
<td>Direct LDL-cholesterol</td>
<td>Rheumatoid factor</td>
<td>Cystatin C</td>
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<tr>
<td>HDL-Cholesterol</td>
<td>Alkaline Phosphatase</td>
<td>Total protein</td>
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<tr>
<td>Triglyceride</td>
<td>Calcium</td>
<td>Urea</td>
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<tr>
<td>Apolipoprotein A</td>
<td></td>
<td>Phosphate</td>
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<tr>
<td>Apolipoprotein B</td>
<td></td>
<td>Urate</td>
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<tr>
<td>C-reactive Protein</td>
<td></td>
<td>Creatinine (urine)</td>
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<tr>
<td>Fibrinogen</td>
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<td>Sodium (urine)</td>
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<tr>
<td>D-dimer</td>
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<td>Potassium (urine)</td>
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<tr>
<td>Lipoprotein (a)</td>
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<td>Albumin (urine)</td>
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<tr>
<td><strong>Cancer:</strong></td>
<td><strong>Liver:</strong></td>
<td><strong>Renal:</strong></td>
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<tr>
<td>SHBG</td>
<td>Albumin</td>
<td>Creatinine</td>
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<tr>
<td>Testosterone</td>
<td>Direct Bilirubin</td>
<td>Cystatin C</td>
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<tr>
<td>Oestradiol</td>
<td>Total Bilirubin</td>
<td>Total protein</td>
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<tr>
<td>IGF-I</td>
<td>Gamma glutamyltransferase</td>
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<tr>
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<td>Alanine aminotransferase</td>
<td>Phosphate</td>
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<tr>
<td></td>
<td>Aspartate aminotransferase</td>
<td>Urate</td>
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<tr>
<td><strong>Diabetes:</strong></td>
<td><strong>Renal:</strong></td>
<td>Creatinine (urine)</td>
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<tr>
<td>HbA1c</td>
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<td>Sodium (urine)</td>
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<tr>
<td>Glucose</td>
<td></td>
<td>Potassium (urine)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Albumin (urine)</td>
</tr>
</tbody>
</table>
UK Biobank imaging study underway

Magnetic resonance imaging (MRI) scans of the brain, heart and abdomen
UK Biobank imaging study underway

Ultrasound scan of the neck to examine and measure blood vessels
UK Biobank imaging study underway

Low dose X ray of the bones and joints
UK Biobank imaging study underway

• Imaging centre constructed at coordinating centre in Stockport

• Imaging assessments progressing well
  – >2,000 participants scanned
  – Target of 18 participants per day achieved
  – ~25% of invited participants have attended
  – Imaging data quality excellent
Access to UK Biobank for research

- Launched April 2012
- Over 1000 registered researchers
- Almost 300 research applications considered
- Over 80 projects underway/completed
  - investigating the causes of diseases in middle and old age
  - predominantly from UK academic institutions
- 23 research papers now published