The UK Biobank Imaging Study

UK Biobank 2019 Scientific Conference
Paul M Matthews, on behalf of UK Biobank and the Imaging Working Group
Numbers

- 1000 approved projects
- 60% with image phenotype data
- 23% with raw images

>90% of planned protocol consistently achieved

5 clinical imaging modalities

Participants scanned so far

40000

4 imaging centres

3 countries

100,000 people
Uniqueness

Brain

- 2500 brain imaging derived phenotypes
- 11,000 individual characteristics

Mass univariate correlations

K Miller et al. Nat Neurosci 19 (2016) 1523-1536; Wenjia Bai et al., Imperial College, unpublished data
Cardiac structures in the healthy population are influenced by polymorphisms in genes causing cardiomyopathies.
Value

Artificial intelligence and a simple eye scan can predict major cardiovascular events

<table>
<thead>
<tr>
<th>Risk factor(s) or model used for the prediction</th>
<th>AUC (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age only</td>
<td>0.66 (0.61,0.71)</td>
</tr>
<tr>
<td>SBP only</td>
<td>0.66 (0.61,0.71)</td>
</tr>
<tr>
<td>BMI only</td>
<td>0.62 (0.56,0.67)</td>
</tr>
<tr>
<td>Gender only</td>
<td>0.57 (0.53,0.62)</td>
</tr>
<tr>
<td>Current smoker only</td>
<td>0.55 (0.52,0.59)</td>
</tr>
<tr>
<td><strong>Algorithm only</strong></td>
<td><strong>0.70 (0.65,0.74)</strong></td>
</tr>
<tr>
<td>Age + SBP + BMI + gender + current smoker</td>
<td>0.72 (0.68,0.76)</td>
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<tr>
<td>Algorithm + age + SBP + BMI + gender + current smoker</td>
<td>0.73 (0.69,0.77)</td>
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<tr>
<td><strong>SCORE$^6,7$</strong></td>
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<td>Algorithm + SCORE</td>
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Predicting risks of metabolic disorders using body composition imaging
Value

Predicting risks of metabolic disorders using body composition imaging
Next steps

Defining outcomes risk trajectories

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<td>n=500,000</td>
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**Neurogenerative conditions**

- Dementia: 43,000, 8,500
- Parkinson’s Disease: 9,500, 2,000

**Other conditions**

- Stroke: 28,500, 5,500
- MI: 22,000, 4,500
- COPD: 31,500, 6,500

**Incident cases predicted by 2026**

**Next steps**

**Defining outcomes risk trajectories**

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**Incident cases predicted by 2026**

+ demographic, lifestyle and clinical data

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Next steps

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**Incident cases predicted by 2026**

+ demographic, lifestyle and clinical data + 2 yr interval re-imaging (10K)

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**Incident cases predicted by 2026**

+ demographic, lifestyle and clinical data + 2 yr interval re-imaging (10K) + 2.5-7 yr interval re-imaging (60K)

UK Biobank and the Imaging Enhancement are huge team efforts: acknowledging the Funders and Imaging Working Group and the many other advisors

**Musculoskeletal Advisory Group**
Chair: Prof Cyrus Cooper (MRC Life Course Epidemiology Unit; Southampton)
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Prof James Duncan (Yale)
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Herve Delingette (INRIA)
Prof Daniel Rueckert (Imperial College)
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