



Enabling longitudinal health research at scale

UK Biobank is a pre-eminent health research resource.

With a unique combination of **scale**, **depth**, **duration** and **accessibility**, the resource is enabling researchers worldwide to make scientific discoveries that improve human health.

Since 2015, nearly **70,000** cohort participants (of a prospective 100,000) have attended the **UKB Imaging Study**. Up to **60,000** participants are now being invited back to attend the **UKB Repeat Imaging Study** (2023–2028)^{2,3}.

Data collection - lifestyle, cognition, repeated brain, cardiac, and abdominal MRIs, DXA, carotid ultrasound, retinal OCT, and colour fundus photographs.

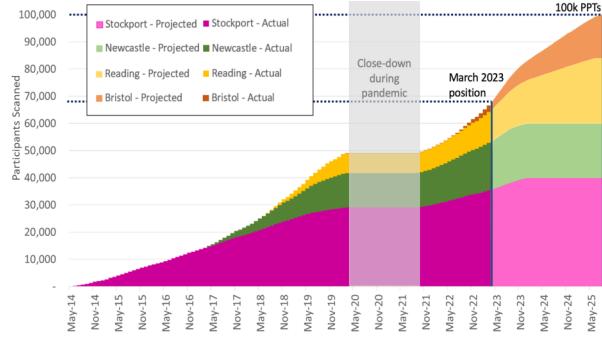


	~n, Baseline	
Age	40-49	119,000 (24%)
	50-59	168,000 (34%)
	60-69	213,000 (42%)
Sex	M	230,000 (46%)
	F	270,000 (54%)
Ethnicity	White	473,000 (95%)
	Other	27,000 (5%)
Deprivation	More	92,000 (18%)
	Average	166,000 (33%)
	Less	241,000 (46%)
Total		500,000

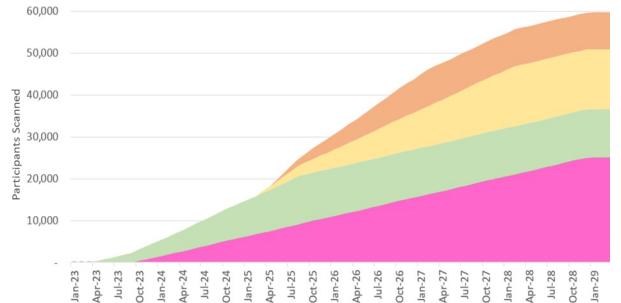
Methods of cohort characterisation

Characteristics of the cohort

UKB Imaging Study Progress



UKB Repeat Imaging Study Progress

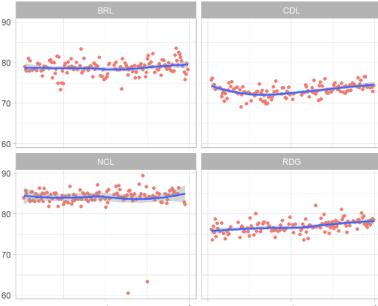


Ensuring quality in a multicentre longitudinal imaging project - consistency is key

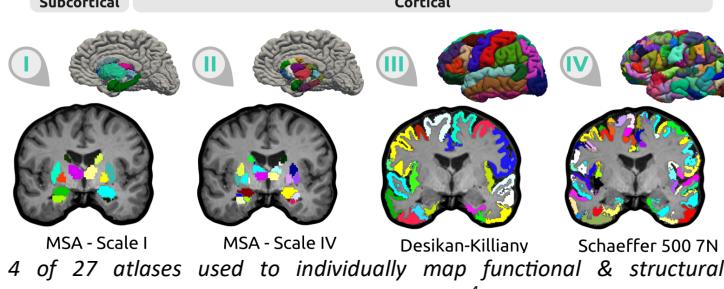
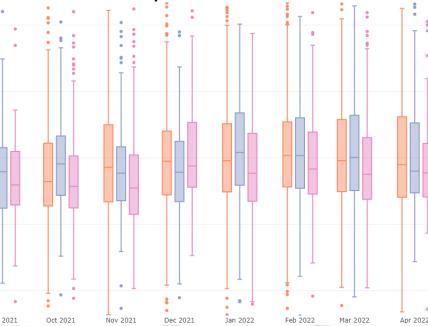
- Visual assessments by clinical scientists/radiographers/health care assistants
- Dip testing, e.g., signal-to-noise ratio in MR phantom images
- Monitoring system parameters, e.g., MR, grip dynamometer
- Close to acquisition derivation and monitoring of phenotypes
- Collaboration with working groups - [Imaging¹⁰](#), [Genetics](#), [Vision⁶](#)
- Feedback on UKB quality:
 - DXA - 98% usability from 40,963 datasets
 - Cardiac MRI - 86% with full left ventricular coverage
 - Abdominal MRI - 92.3% usability from 20,000 datasets

MR phantom

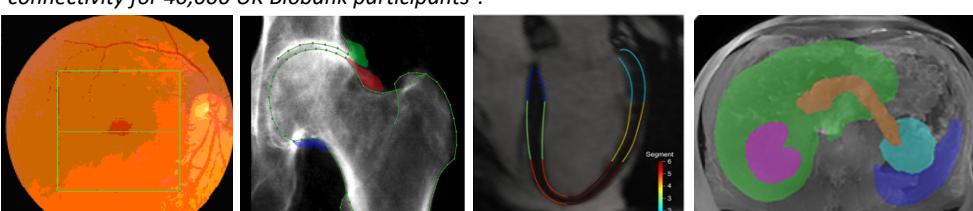
Signal/Noise over the last 6 months since 2023 06



Mean intensity of 3rd ventricle



4 of 27 atlases used to individually map functional & structural connectivity for 40,000 UK Biobank participants⁴.



1. A UKB retinal OCT image. 2. Semi-automated osteophyte labelling of UKB DXA images⁹. 3. Segmentation of the endocardial and epicardial heart walls⁶. 4. Abdominal organ separation¹⁰.

References

- Sorokin, 2022
- BBC, 2023
- Foster, 2023
- Mansour, 2023
- Alfaro-Almagro, 2021
- Warwick, 2022
- Bai, 2020
- Baisioli, 2019
- Faber, 2022
- Kart, 2022
- UKB Brain imaging Pipeline
- Douaud, 2022

Recent highlights from UK Biobank imaging researchers

- OCT - Characterise retinal features of age-related macular degeneration (AMD), glaucoma, and retinopathy³
- MRI - Extensive functional and connectivity brain connectomes and parcellations⁴
- MRI - Characterisation of cardiac structure and function^{7,8}
- MRI - Abdominal organ segmentation and characterisation^{1,10}
- MRI - Changes in brain structure after SARS-CoV-2¹²
- DXA - Classification of hip osteoarthritis⁹

UKB Research Analysis Platform

Tools - Freesurfer, FSL, nipype, & installation permissions

- Suggestions very welcome!

Financial Research Credits

- Early career researchers
- Low & middle income countries



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