UK Biobank

Eye and Vision Consortium

Paul Foster

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Impact of Eye Disease in the UK

- 5.8 million: sight threatening conditions
- 2.1 million: vision loss that prevents driving

- Among over 75’s
  - 10% partially sighted
  - 2% blind

- £ 3 billion - Direct costs of sight loss
- £ 25 billion – Indirect costs of sight loss
Eye Care 2015/16

- 16.3 million sight tests
- 8.2 million hospital appointments
- 396,000 cataract operations
- 2.9 million diabetics under retinopathy photographic screening
If you could choose, which one of the following senses would you least like to lose?

- Sight
- Smell
- Hearing
- Touch
- Taste
UK Biobank Baseline Eye Data

On 129,761 people
- Visual Acuity
- Autorefraction & keratometry
- Intraocular pressure
- Corneal biomechanics

On 87,642 people
- Retinal photographs & HD-OCT
“Results support the notion that refractive errors are caused by a light-dependent retina-to-sclera signaling cascade and delineate potential pathobiological molecular drivers.”
Genome-wide analyses identify 68 new loci associated with intraocular pressure and improve risk prediction for primary open-angle glaucoma

“Genetic-prediction models for POAG offer an opportunity to target screening and timely therapy to individuals most at risk"
Genome-wide association study of intraocular pressure uncovers new pathways to glaucoma

Stuart MacGregor1*, Jue-Sheng Ong1, Jiyuan An1, Xikun Han1, Tiger Zhou2, Owen M. Siggs2,

“identified 101 statistically independent genome-wide-significant SNPs for IOP, 85 of which have not been previously reported”
Human genetics of complex retinal anatomy revealed by large scale imaging
QUARTZ RETINAL VASCULOMETRY SYSTEM
(in progress)

Kingston
Sarah Barman

St Georges
Chris Owen
Alicja Rudnicka
Using deep-learning algorithms trained on retinal images from 284,335 patients they predicted cardiovascular risk factors not previously thought to be present or quantifiable in retinal images:

- age (within 3 years)
- gender (0.97% accuracy)
- smoking status (71% accuracy)
- blood pressure (within 11 mmHg)
- major adverse cardiac events (70% accuracy)

The trained deep-learning models used anatomical features, such as the optic disc or blood vessels, to generate each prediction.
Research Groups

Funding

Nutrition & Eye

Over the past two decades there has been substantial progress in linking nutrition to sight threatening diseases such as age-related macular degeneration (AMD), glaucoma and diabetic retinopathy.

Read More

Cataract

Cataract is the leading cause of blindness in the world.

Read More

Giant Cell Arteritis & Polymyalgia

Both giant cell arteritis (GCA) and polymyalgia rheumatica (PMR) are rheumatologic disorders which appear to have an autoimmune basis.

Read More

Intraocular Pressure

Intraocular pressure (IOP) is one of the main risk factors for the development of glaucoma, a degenerative condition of the optic nerve.

Read More

Retinal Detachment

Rhegmatogenous retinal detachment (RRD) is a common sight threatening condition that affects over 7,000 people annually in the UK.

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Optical Coherence Tomography

Optical coherence tomography (OCT) imaging has transformed many aspects of macular.

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80 Consortium members

22 Health science centres across Scotland, Wales, Northern Ireland and England

Bristol
Cambridge
Cardiff
City, London
Dundee
Edinburgh
Essex
Gloucester NHS
Kings, London
Kingston
Leeds
Liverpool
Manchester
Moorfields NHS
Newcastle
Nottingham
Queens, Belfast
Southampton
St Georges
UCL – Institute of Ophthalmology
UCL – Institute of Child Health
UEA

http://www.ukbiobankeyeconsortium.org.uk/
UK Biobank Eye and Vision Consortium

UK BioBank Eye & Vision Consortium
3rd Annual Meeting
The Vision & Eye Health Forum, Edinburgh
Commercial & International Interest
• One of the world’s largest ophthalmic datasets
• Large UK-based consortium facilitating analysis of data
• Industry-academic collaboration has helped to develop data
• Development of UKBB offers novel insights into eye disease in the UK and worldwide