



UK Biobank Eye and Vision Consortium

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There have been some new data updates to the Data Showcase. Health outcomes data including primary care, hospital and death, first occurrences of a wide range of medical conditions and algorithmically-defined health outcomes are available. Additional imaging data on brain MRI scan is available. Finally, the exome sequence data on 50,000 participants and biomarker data are also available.

Some of the eye publications are described in the next few pages.

In this Newsletter:

- Release of new data on biomarkers, health outcomes, brain MRI and genetics
- Next Annual meeting
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- Publication news
- Welcome section

Do you have an item for our next newsletter?

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UK Biobank in the press

Air Pollution is linked to higher glaucoma risk

<https://www.telegraph.co.uk/science/2019/11/25/air-pollution-linked-blindness-scientists-say-particles-may/>

<https://www.independent.co.uk/news/health/air-pollution-glaucoma-risk-link-study-a9217031.html>

<https://www.sciencefocus.com/news/living-in-areas-of-high-air-pollution-linked-to-glaucoma-risk/>

Quantile regression analysis reveals widespread evidence for gene-environment or gene-gene interactions in myopia development

Refractive error is widely known to be related to both genetics and environmental factors such as education and time outdoors. The authors tested the hypothesis that refractive error-associated variants exhibit effect size heterogeneity, a hallmark feature of genetic interactions. There was evidence of non-uniform, non-linear effects for 66 variants at Bonferroni-corrected significance ($P < 1.1 \times 10^{-4}$) and 128 at nominal significant ($p < 0.05$) LAMA2 variant rs12193446, had an effect size that varied from -0.20 D to -0.89D in different individuals. In addition, SNP effects were observed to be strongest at the phenotype extremes and weaker in emmetropes. These findings may indicate a gene-environment or gene-gene interaction in myopia.

Pozarickij A, Williams C, Hysi PG, Guggenheim JA. Quantile regression analysis reveals widespread evidence for gene-environment or gene-gene interactions in myopia development. Communications biology 2019; 2: 167.

[Link to PDF](#)

Frequency and distribution of corneal astigmatism and keratometry features in adult life: Methodology and findings of the UK Biobank study

A large study of 83,751 participants was performed to evaluate the associations with corneal astigmatism. In this study, 69%, 29%, 11% and 5% had corneal astigmatism ≥ 0.5 , 1.0, 1.5 and 2.0 dioptres, respectively. In multivariate analysis, corneal astigmatism was lower in older age, males, Asians, participants with darker skin colour, higher frequency of alcohol intake, completed education at an earlier age, higher IOPcc and with lower Townsend deprivation index.

Pontikos N, Chua S, Foster PJ, Tuft SJ, Day AC. Frequency and distribution of corneal astigmatism and keratometry features in adult life: Methodology and findings of the UK Biobank study. PLoS One 2019; 14(9): e0218144.

[Link to PDF](#)

Associations with Corneal Hysteresis in a Population Cohort: Results from 96,010 UK Biobank Participants

A large cross-sectional study of 93,345 participants was performed to examine the distribution of corneal hysteresis (CH) and explore its associations with demographic, lifestyle, ocular and systemic variables. Multivariate analysis showed that CH was lower in males, older age, black participants, self-reported glaucoma, participants with higher blood pressure and taller participants. In contrast, CH was higher in participants with more positive refractive error and higher IOPg, smokers and participants with higher Townsend deprivation index and those with self-reported diabetes. Hence, these factors should be taken into account when interpreting CH values.

Zhang B, Shweikh Y, Khawaja AP, Gallacher J, Bauermeister S, Foster PJ. Associations with Corneal Hysteresis in a Population Cohort: Results from 96 010 UK Biobank Participants. Ophthalmology 2019.

[Link to PDF](#)

Comparison of Associations with Different Macular Inner Retinal Thickness Parameters in a Large Cohort

Associations of demographic, socioeconomic, lifestyle and ocular factors with macular retinal nerve fibre layer (mRNFL), ganglion cell complex (GCC) and ganglion cell-inner plexiform layer (GC-IPL) were evaluated in a large study of 42,044 participants. Thinner inner retinal was associated with older age, male participants, non-white ethnicity, lower educational attainment, higher frequency of alcohol consumption, greater social deprivation, participants with diabetes and higher IOPcc. These findings are important to consider when using inner retinal parameters as a diagnostic tool. The associations were generally strongest for GC-IPL, particularly for IOP. Hence, this suggests that GC-IPL may be the superior inner retinal biomarker for macular pathophysiologic processes, especially for glaucoma.

Khawaja AP, Chua S, Hysi PG, et al. Comparison of Associations with Different Macular Inner Retinal Thickness Parameters in a Large Cohort: The UK Biobank. Ophthalmology 2019.

[Link to PDF](#)

A commonly occurring genetic variant within the NPLOC4–TSPAN10–PDE6G gene cluster is associated with the risk of strabismus

Strabismus refers to an abnormal alignment of the eyes that leads to loss of central binocular vision. GWAS for self-reported strabismus (1345 cases and 65,349 controls from UK Biobank) showed a single genome-wide significant locus on chromosome 17q25. There were approximately 20 variants across the *NPLOC4–TSPAN10–PDE6G* gene cluster and in almost perfect linkage disequilibrium (LD) were most strongly associated (lead variant: rs75078292, OR=1.26, $p=2.24 \times 10^{-08}$). The association with strabismus was replicated in another study sample of 7 year old children with clinician-diagnosed strabismus (OR=1.8; $p=0.009$).

Plotnikov D, Shah R.L, Rodrigues J.N, et al. A commonly occurring genetic variant within the NPLOC4–TSPAN10–PDE6G gene cluster is associated with the risk of strabismus. Human Genetics 2019.

[Link to PDF](#)

Association Between Polygenic Risk Score and Risk of Myopia

Myopia prevalence is increasing worldwide. It is important to identify children at high risk of myopia development, who may benefit from early intervention. Estimating disease risk using a polygenic risk score (PRS) allows at-risk individuals to be identified at any age from birth onwards. A total of approximately 380,000 adults from the UK Biobank were included in the GWAS analyses. A PRS was applied in a population-based validation sample in the ALSPAC study. The PRS obtained an AUROC of 0.67, 0.75 and 0.73 for myopia, moderate myopia and high myopia, respectively. Including information on genetic predisposition to educational attainment in the PRS marginally improved the AUROC for myopia (AUROC 0.674 vs 0.668; $P=0.02$), but there was no difference for moderate and high myopia. Individuals with a PRS in the top 10% had 6 times higher risk of high myopia. This suggests that personalized medicine approach may be feasible for very young children at risk of myopia.

Mojarrad N.G, Plotnikov D, Williams C, et al. Association Between Polygenic Risk Score and Risk of Myopia. JAMA Ophthalmology 2019.

[Link to PDF](#)

Welcome section

Denize Atan

<http://www.bristol.ac.uk/clinical-sciences/people/denize-atan/index.html>

Denize is currently working as a Senior Clinical Lecturer and Honorary Consultant in Neuro-ophthalmology at the Bristol Eye Hospital. She is a member of the Bristol Vision Institute's management team. She is a member of the small grants panel for Fight for Sight and a community ambassador for Fight for Sight.

Eleni Beli

<https://pure.qub.ac.uk/en/persons/eleni-beli>

Eleni QUB Vice Chancellor's Fellow and is interested in identifying lifestyle factors that affect the progression of vision loss due to diabetes and design interventions to delay the onset of diabetic retinopathy.

Next UKBB Eye & Vision Consortium Annual Meeting:

FRIDAY 7TH FEBRUARY 2020

WELLCOME TRUST

183 Euston Rd, London NW1 2BE

Agenda items
