

Martin

00:00:00	Hello my name is Martin McKibben. I'm a Consultant in the Eye Clinic at St James' in Leeds and I was asked to come and speak to you about a small project which I did which is not shattering in its information but it was a project which was completed and that was about vision in the UK Biobank study.
00:00:18	In my job I see you know people with eye diseases and I've also got some research time so I'm actively involved in research and I was very attracted with the idea of UK Biobank, just the size of the database that it would collect. So it would be my life's work trying to get access to the data itself let alone do the analysis so what I realised quite early on what a great resource UK Biobank was for people like me who are interested in doing research and there is now an eye and vision consortium which is made up of eye doctors like me and scientists who are involved in vision research and they come from eye departments and university departments. So there's quite an active consortium and there are all sorts of different groups as I think you learnt from the prior speaker we've even got rheumatologists in there, I don't quite know how they got in! But people are interested in various aspects of eye disease and eye measures and to see what are the consequence of those..
00:01:15	So in my day to day job I only see people who have got problems affecting the back of the eye and my teenage daughter has absolutely no idea what I'm talking about when I say it's the film inside a camera. She just looks at me blankly and says "films/camera's what are you on about". Anyway so I see people who have got retinal disease which is disease affecting the film inside the camera if you use that analogy and most of the people I see are older and usually when I ask them they tell me they've already got... they're known to have other conditions so high blood pressure and diabetes and smokers and for them their eye disease is a marker of the fact that they're... of generalised ill health and for the ones who don't yet have their generalised ill health my suspicion has always been that actually the eye disease is the first sign of problems about to come.
00:02:03	So what I hope to do with UK Biobank is to look at the people who we knew had some visual impairment at the time they were enrolled. Find out what were the factors... what were the risk factors and possibly new associations that led to the development of their eye disease and because of all the data being collected in UK Biobank I had 19 different measures from socioeconomic status, physical measures so body mass index, waist/hip ratio, lifestyle factors including diet and smoking and then medical history. So I could look at all of those in the people who did have visual impairment and those who didn't and that would be a case controlled study.
00:02:43	So my memory... although I didn't participate in UK Biobank was that everybody had a questionnaire or an interview. It wasn't quite this sort of interview it was more of a touchscreen questionnaire with a verbal interview I think to clarify things. So that was done on 500,000 and I think at the beginning that did include a little bit of eye health data. And then about 120,000 went on to have additional eye data collected and that included measuring their vision and trying to work out should they be working glasses and if so were their glasses correct and then about 60,000 had imaging of the back of the eye with one of these things and they also had a scan done of their eye.
00:03:24	So this is a photograph of the back of a healthy eye. I don't think it's my eye but it is a healthy eye. So just to talk you through it, this is the retina, this is the so called film in the camera. It's often got that orangey sort of red colour. These are the normal blood vessels that carry blood to the retina and this is the nerve at the back of the eye which relays the message from your eye back to your brain. So that's what a normal eye looks like.

00:03:47	And if you had taken that eye out and seen sliced it up a bit like a tomato and then looked at it under a microscope you'd get an image very similar to this. So this is the scan of the back of the eye and the machine that was used both took a photograph and took a scan. So you'll see the number 70 up there so we took 126 scans and that's what your retina would look like if it was... if you did give it up for science and for looking at. So it normally gets a bit thinner in the middle which is just what this does and it's composed of a series of alternating coloured bands.
00:04:18	So my plan, my strategy was that I would look at the data that people gave from the interviews and I would also look at whether they were wearing glasses or contact lenses or whether they had forgotten them and should have been wearing them. So I would add that to the grading of the images. So we'd look at all the images from everybody who had impaired vision in one or both eyes and that would come up with the diagnosis. So it was quite a simple plan.
00:04:41	So we started off looking at the images to try and work you what... you know what did we think was the main cause of visual impairment? So that's another normal eye and this is one that you might look at it and think "well I can just about see a nerve there" but it's almost as if there's a filter or something in the way that's stopping the camera from getting a good view. So we worked out that this was probably cataract, that's very common yeah. So cataract means it's difficult for the camera to take a picture of the back of the eye and it's equally difficult for people to see through it and ignore that sort of green box that just shows where the scan was done.
00:05:11	So we looked to see if there was cataract or anything else that was topping the camera from getting a good view of the back of the eye. We look at the nerve here. So this person has almost certainly got glaucoma, I can't remember if they knew they did or didn't so we look at the function of the structure of the nerve. We looked at the blood vessels in the retina. So you can see here, these blood vessels have got some white sort of stuff around them which is probably fibrosis, they've probably had a blocked blood vessel some time ago.
00:05:38	And then we looked in detail at problems affecting the surface of the retina and inside the retina and there's a sort of vague sort of shimmery reflex there so they've probably got... this person's probably had some scar tissue over the surface of the retina. And subtle things like that are quite difficult to see on a photograph. They're suddenly much more obvious to see on the scan. So this person's got a visual impairment because the jelly in the middle of the eye is sort of pulling on it, it's nipping it like this which is affecting the central bit of the vision. So you can't see that if you look in somebody's eye you can't see it on a photograph, you need a scan like this to pick it up and this person's got for example a hole in the retina so they've got a macular hole and that would be why their vision would be impaired.
00:06:20	So we've tried to look at the front of the eye, look at the retina, look at the nerve and look at various things to work out what the cause of it was and then as I said we also took a count of whether somebody was wearing glasses at the time or if they said "look I should have glasses but I've forgotten them or I've brought my reading pair and I haven't got my distance pair" and then because their prescription was sort of measured at the time we can try and work out... if we couldn't find any other reason was it because they should have been wearing glasses but weren't.
00:06:51	So as I said Biobank was a wonderful resource. I was told that about 63,000 people had had a vision test done on both eyes and had a photograph and had given a history of eye disease. So that was my group that I was looking at but of those just under 8,500 had visual impairment in one or both eyes. So my original plan was to look at the images for those 8,500, compare it with four times the number of

	people who didn't have visual impairment and then try and work out what were the differences between them but I was a little bit nervous about how easy how useful these images would be so I decided I would start off looking at a quarter and I got funding to do that from a commercial firm who were interested in the data.
00:07:39	So of the 2,000 sets of people whose eye images I looked at, about 12% of them had visual impairment either in one eye which means they had one bad eye and one good eye or they had problems with their vision in both eyes and there was a cut-off which we used which was fairly well defined.
00:07:54	So went back 13% had it and about four times... having impaired vision in one eye was about four times more common and most of them the visual impairment was mild or moderate. Having sever visual impairment was rare.
00:08:09	So we tried to look and see what factors were more common in the people who did have impaired vision in one or both eyes compared to those who didn't and we found some things which added to your risk. So for the large group of people who only had visual impairment in one eye you were less likely to be black or black British ethnicity. You were more likely to be deprived. So depending on your post code you can attach what's called a deprivation index to it and that will look at a variety of factors which are known for people who live in that area. And the richer or less deprived you are the higher your score so you might have a score of one whereas if you're very socioeconomically deprived you'd have a score of five.
00:08:47	So our data suggested that you were more likely to have visual impairment in one eye if you were more deprived but we don't know if that was the cause of the visual impairment or if that was a consequence. So you know it may be that people who can only see out of one eye, you know they struggle at school, they struggle in education, they struggle to get a good job. And then you were more likely to be a current smoker if you had visual impairment in one eye.
00:09:14	And then looking at the people who had problems with their vision in both eyes, they were typically older, they were more likely to be black rather than less likely, typically they were more likely to be deprived socially economically and they were also more likely to be unable to work – unemployed or need a carer and that's sort of something you can imagine being a consequence of your visual impairment.
00:09:40	So when I went through it we had a whole load of possible reasons to why somebody might have visual impairment in one or both eyes. Disappointingly for me we couldn't work out at all why people had visual impairment in about half the cases. So that's probably a limitation of the reliance on eye history and the images but for the identifiable groups we found having a lazy eye was the most likely cause of visual impairment when only one eye was affected and then cataract not forgetting your glasses, having the wrong glasses or not wearing glasses when you should have done was a big cause. And then having problems affecting the surface of the retina was another cause.
00:10:25	So in summary going back to my daughter outside who will be onto her third glass of wine by now! So my experience of looking at the eye group in Biobank was the image quality was variable but the scans were particularly helpful in identifying disease and I think one of the findings that is publishable from my data is that problems affecting surface of the retina probably account for about 4% of visual impairment in people in the UK Biobank cohort and I don't think that's been found before for a similar population. Disappointing that we couldn't work out the cause in about half the participants and overall the frequency of visual impairment was slightly lower than for populations but that probably represents the fact that you could opt in to UK Biobank and I think people who were in UK Biobank were typically healthier and had less disease and the four most common identifiable

	causes we found were having a lazy eye, forgetting your glasses, having cataract or having this problem affecting the surface of the retina and visual impairment we did note was associated... you were more likely to be visually impaired compared to those who weren't if you were older, if you were more socially/economically deprived, if you were unemployed or unable to work and if you're a smoker. Thank you very much.
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