Sir John Bell: Thanks Gil very much. I thought it would be helpful to the audience to understand a little bit about how the UK is thinking about how we go forward in this space and this comes from a major government initiative which was started about three years ago, which was called the industrial strategy. The government realised that things were going to get a bit choppy. I think they didn't realise how choppy they were actually going to get, but anyway let's leave that aside. They decided to introduce a policy whereby they would invest into certain areas of potential economic growth for the country and that they would identify strategies around a number of those domains. The first strategy they chose and they asked me to lead was in the areas of life sciences. So I've been busy over the last couple of years building a wider strategy for life sciences in the UK. It won't surprise you to hear that if you're trying to create opportunities in this space it's really valuable to think about what's worked and how that influences what you do in the future. So, you will see as I talk about it how UK Biobank has actually had a profound influence on many of the things we were doing across other projects in the life sciences industrial strategy.

So we produced a report two years ago which describes in great detail the sorts of things we're going to want to do and the highlights of the strategy sit around many of the strengths that we have in the UK. First of all commitment to strength in the science base which underpins much of the activity that we have, but also to enhance our abilities to do clinical trials, particularly using digital data to do clinical trials. Obviously, scaling innovative companies is an issue for the UK and there's a commitment to that, trying to identify the new therapeutic platforms, particularly those in the cell and nucleic acid-based therapy space and then some domestic aspects of adoption in the NHS. But central to this was the idea that we would try and create support for three new healthcare life sciences industries in the UK and that was probably the central pillar for the whole strategy. Of course, when you start to think about that, it's not good enough to say, well let's build another pharma company because that's not really going to work. So you need to think about things that are going to expand and develop over the next 20 years into major industrial sectors and major research activities over the next 20 years.

The first one is obviously genomics and this has been driven by a whole load of activities in the UK really going back a very long way to the sequencing of the genome and it has an influence on a variety of different territories, the technology under which we do sequencing, precision medicine, obviously for pharma target discovery. But also increasingly potential important aspects of public health. The second big domain is again an area which is very integrated with genomics and I think what has become really evident is that genomics on its own is kind of interesting, but the truth is it really generates interest when it's in the context of extensive phenotypic data. The best place to get that phenotypic data is obviously from healthcare systems. Here, I think the UK has a unique offering in healthcare data. We've got 65 million people all now in digitised records. One of the great things about UK Biobank, it was the forerunner for accessing that data in a productive way to line up with all the other phenotypes that we have available. So our second big domain was digital health and we're now seeking a pretty large investment to try and curate and structure all the data within NHS Digital systems so that it would be available for a range of these projects.
Then the third big space is in the area of public health really, but early diagnosis. So the ability to identify people with disease earlier in their life history is I think a crucial bit for all healthcare systems. At the moment we treat people late. In some bits of this country half the cancer patients are diagnosed in the A&E department. That's not very helpful. Moving the diagnostic paradigm much earlier is an important piece of changing healthcare generally and over the next ten to twenty years, this is undoubtedly going to be a major industry in its own right. So again, building off the terrific experience from UK Biobank on polygenic risk scores we designed a large prospective cohort that will allow us to do that at scale, and again have had very substantial investment from government.

So, dropping back to the genomics, the goal of our genomic strategy is to try and get to the genomes in UK Biobank sequence. There is a process in place bringing together a range of different partners. This was led by a commitment by the UK Government of 100 million pounds to do this. We are bringing together a group of partners and we hope that that will yield a project sometime in the very near future. So that is a very exciting project and I think Kerry in a minute is going to give you a justification for why you might want to do those sorts of projects. We're also now committed to sequencing 100,000 rare disease genomes every year for Genomics England. That is a big sequencing effort that will also add to our genomic sequencing capabilities. Public Health England is converting its microbiology to genomic sequencing. At the moment there have been a number of projects around specific pathogens and that's being spread wider now.

There are thoughts about whether we do neonatal screening with genomics. That is still in discussion. The intention also is to try and run a programme where we start by sequencing the genomes of 50,000 cancer patients every year and then expand that over time. Obviously, we're also very keen to expand the different sequencing platforms we're using. We are having helpful conversations with BGI and with Oxford Nanopore. Finally, as part of this, we're intending to use polygenic risk scores across the early diagnostic cohort which will be five million people which will start to embed that particular methodology in the public health arena. So in terms of long scale genomics, this is broadly the picture. Everything from sequencing in Biobank which we hope to launch in the near future. The GEL programme for which resource is committed by the NHS and will be expanding over the next few years and then the early diagnostic cohort which is largely public health and snip-based but will actually give us the opportunity to define high risk sub populations.

Now, as I said earlier and I think as Gil has alluded to, the truth is you really want the genomics in the context of a whole set of other healthcare data and again we're making real efforts to try and make that happen at scale. We've got a major digital pathology programme which is the biggest in the world which we've launched, imaging programmes, as well as just accumulating the routine health data in a way that people can get access to it. This gives you a sort of summary of the assets that we've got in the UK on the data space which includes genomics obviously, but much of this is built on the idea that getting access to those extensive and distributed healthcare datasets alongside the unique genomic access programme is going to be a really exciting piece for this country to pursue. The early diagnostic cohort I'll spend two minutes on. That's the cohort of five million people. We've had a commitment from government of 80 million pounds to get this
started and we expect in the end to raise close to 300 million pounds to make this work. We've got commitments from both industry and charities to help make that happen.

The idea is to use it to test a whole range of new diagnostic tools, but also to collect samples as you lead up to disease in a repeated sampling framework to allow you to go back from instant disease patients to identify markers in disease that predict those disorders, but also to create high risk sub cohorts using he PRS as a methodology. Ultimately to identify the people with early disease and see whether therapies work in early disease rather than late disease. Of course, cancer is the poster child for that. This is a slide which gives you a sense of how we're going to make this work. We're going to consent five million people, healthy individuals aged 30 to 75. We'll do polygenic risk scores in all of them to identify high risk sub cohorts, to take the highest three or five per cent you get, more than 150,000 people who are at very high risk of disease. Those can then be intensively sampled, but we'll also have a set of repeated blood samples which we'll do in a million people where we'll take a blood sample every year until they develop incident disease.

So we think this is again all dependent on UK Biobank. This whole study has been built off the expertise this country gained from Rory and his colleagues as they developed the UK Biobank study. It's got some additional tweaks. We'll be returning data to patients. That's complicated. We'll be recalling patients, but we think it's the next obvious step forward for this programme. So as you can see, the life science industrial strategy is very much Biobank plus using the expertise we've gained from that and the special characteristics of the UK healthcare system to take it forward. So thanks Gil.

[END OF TRANSCRIPT]