**The G Word**

**Reflecting on 2023 transcript**

**Naimah:** **Welcome to the G Word.**

Rich: We’re in an extraordinary time. The power to analyse genomic data has changed enormously. These are big changes in terms of the, sort of, analytics that AI could bring and the potential to work not just within the UK but with other countries and other big initiatives to make sure that we’re answering the questions as best we can.

**Naimah:** **I’m your host Naimah Callachand and today we’ll be hearing from Rich Scott, Interim CEO for Genomics England. He’ll be sharing insights with us from the last year, and we’ll be revisiting key moments from earlier podcasts in the year featuring some of the voices that have shaped our discussions. If you enjoyed today’s episode we would love your support, please like, share and rate us on wherever you listen to your podcasts. Now let’s get into the interview.**

 **So, this year we celebrated our ten-year anniversary and as 2023 comes to a close we want to reflect on our achievements not just in the last year but over the last ten. So, Rich first of all can you talk us through where we started in 2013 and where we are now?**

Rich: It’s amazing really to think about how much things have changed in terms of genomics in clinic and in hospitals and then for us as Genomics England over the last ten years. So, actually thinking back ten years ago was only ten years after the Human Genome Project was completed, and when one thinks about what one could do in clinic and those questions you could answer using genomics in clinic. We could see what was coming, we could see these new technologies, next generation sequence in coming, but it was much more dependent on very targeted testing.

And now with, you know, our founding project, the 100,000 Genomes Project that Genomics England was founded to deliver in partnership with the NHS we asked the first big question if you like which was how can whole genome sequencing play a role in routine clinical care. And that’s now played out where evidence from the project, what we’ve learnt, the infrastructure we’ve built, and also evidence from around the world that through the NHS Genomics Medicine Service has now put that into practice and we’re working in partnership to help them deliver it.

So, it has gone from an idea where we could see this new technology, this potential, to a position where now patients in the NHS with cancer or with rare conditions have whole genome sequencing as a routine part of their clinical care where that’s in that national genomic test directory that NHS England have set up.

**Naimah:** **Earlier in the year we heard from Dr Adam Rutherford, geneticist, author and broadcaster who commented on how the public perception of genetics and science has evolved over the last few decades.**

“I’ve been doing this a long time and I think that when it comes down to it, genetics which is a relatively young science and really in a sophisticated way, you know, a mere few decades old, but what is it at its absolute core, it’s thinking about families, it’s thinking about inheritance and it’s thinking about sex. And these have been the major preoccupations of humans for thousands of years, and it’s only really in the last century, really only in the last 30 years or so, that we’ve had a sophisticated understanding of how these things work, if indeed we have had at all.”

**Naimah:** **Let’s get back to Rich. Rich, I’ve already touched briefly on it, but can we dive a bit deeper into the 100,000 Genomes Project and can you tell me a bit more about how it started.**

Rich: Yes, so the 100,000 Genomes Project as I said was there to ask what role can whole genome sequencing play in understanding medical conditions, you know, is it ready for clinical prime time. And also how can we link routine clinical care to research so that we’re not just asking questions with today’s knowledge, but we can continue to build that knowledge for the future.

So, the 100,000 Genomes Project was driven by that idea that people realising, the government realising and the NHS forming a partnership with us Genomics England to explore that question in real depth. And it’s not just about the clinical aspects and the scientific questions, it has also been working with participants and the public to understand how we could do that.

And through the 100,000 Genomes Project we worked particularly with patients with cancer and rare conditions to see how we could help make diagnosis and improve care. And also with their consent make their data available in our secure, trusted research environment so that researchers could continue to look for answers that we couldn’t answer today, and we continue to do that work for those participants now.

**Naimah:** **Next we’re going to hear from an interview with Dr Jack Bartram, a Consultant Paediatric Haematologist at Great Ormond Street Hospital for Children. He spoke about the significance and impact of integrating genomics into routine clinical care in diagnosing cancer in children.**

“If I look back and if I reflect on the last three years, you know, we could probably accurately say at least a quarter of patients it has given us additional information which is either aided in diagnosis or like I had said help risk stratify a patient or potentially reveal a target for a therapy that we didn’t know of before. And what this has led to and what we’ve seen over the last three years or so is that we have actually changed management of patients based on this.

So, definitely we’ve got examples where we scan clarify the diagnosis, we’ve changed the risk category, or we’ve identified for example that an unexpected cancer predisposition in a family which has then led onto screening for the family which can then give the family the knowledge to try and do things to either modify the risk of cancer in the family or at least screen for it so they can detect things early to prevent things presenting too late.”

**Naimah:** **Okay, now let’s talk a little bit about some of the initiatives at Genomics England. Can we talk about how they’ve progressed and what they might look like in the future.**

Rich: Yeah, so we really are on a journey both as an organisation but with all of those partners that we work with across the UK system. And one of the great things I think about genomics and genomics in the UK is that the ecosystem that we’re in and the strong partnerships that we can form to ask these really big questions. So, if you like when we formed as an organisation we had the questions that we’re asking around diagnostic use of whole genome sequencing in the 100,000 Genomes Project.

And if you like in our second chapter as we’ve moved on to support the NHS in delivery of life clinical care we also have been thinking about the other big questions that we need to address. And those have played out and we’ve been really fortunate to gain the funding and to work in partnership with the NHS and others on these big questions. So, firstly our newborn genomes programme, secondly our diverse data programme and then our cancer 2.0 initiative.

And each of them have big questions behind them so that we’re saying, you know, where could genomics better support healthcare and move forward and improve care for everyone. Our vision at Genomics England is a world where everyone can benefit from genomic healthcare and each of them is pushing those boundaries, asking those questions in different ways.

For the newborns programme the big question is should every newborn baby be offered whole genome sequencing driven particularly by that potential to identify more treatable severe genetic conditions at birth, and if so how should we do that. Again, developing evidence in and around really broadly across the clinical and scientific aspects, but also engaging and understanding public attitudes how we might do that. And really understanding how that might impact on the healthcare system, how it might be delivered in clinical care.

For the diverse data initiative we recognise the challenges historically that there have been because of the inequity in terms of the communities who have been engaged with and included in genomic research. And the diverse data initiative aims to both understand where we are today but also to make sure for example the national genomic research library is at least representative of the UK population so that we can work towards again that word that’s in our vision, everyone, a world where everyone can benefit from genomic healthcare.

And in the cancer 2.0 initiative we’ve been exploring two really promising areas in terms of cancer genomics. Firstly, exploring different sequencing technologies and in this case partnering with the NHS to work on the Oxford Nanopore technology which we think is really promising in terms of use in diagnostics to speed up and better diagnose and treat cancers.

And also looking in our multimodal element of our cancer 2.0 initiative at bringing in a broader range of data alongside the genomic and clinical data that participants in our programme consent to us holding in our trusted research environments. And bringing in image data, images of their tumours on the histopathology slides that are looked at traditionally down a microscope but scanning those at very high resolution and with uniformity between participants working with NPIC to do that.

And also bringing in imaging, so radiology type imaging, of tumours so that that data is there to drive new discovery. And working in partnership with academics and with industry for example insitro to understand how we can both bring that data together usefully, put the right tools next to it and then allow that discovery so that our participants know that we’re looking not just on what we know today but to improve things for the future.

**Naimah:** **Rich mentioned some of our initiatives here at Genomics England. And now we’re going to hear from some G Word guests on how these programmes can make a difference for those with a genetic diagnosis. We spoke to Lizzy Mordey, a clinical trials co-ordinator, whose husband Steve sadly passed away last year after receiving a sarcoma diagnosis. Lizzy commented on the pivotal role whole genome sequencing can play in receiving a quicker diagnosis on the identification of suitable treatments for patients with sarcoma.**

“Personally, I would hope for quicker diagnosis, and I know that’s super hard to do and I think as we’ve discussed before on this call it’s such a rare thing and it, kind of, often doesn’t fit the standard clinical pathway and that’s one of the reasons why it’s so frustrating. So, anything that we can do on that front that I think would be hugely valuable to anyone experiencing a journey like what me and Steve went through, and yes advances like genome sequencing are really amazing in supporting that. Yes, as I mentioned as well any information about types of treatment, you know, the diagnosis is important but then the other aspect of getting a diagnosis and a specific diagnosis is understanding what’s most likely to help.”

**Naimah:** **Next we’re going to hear from David Bick who is a principal clinician for the Newborn Genomes Programme at Genomics England. He spoke about the generation study which is being delivered in partnership with the NHS.**

“I’m doing this because I imagine a day when all over the world we will find and treat children before they get ill. This is one of the most wonderful programmes to be involved with because I can see that future. I want there to be a healthcare system. I really want to help children stay healthy and really live their best lives, that’s what’s so exciting for me.”

**Naimah:** **Now let’s get back to the interview with Rich. You mentioned all of the partnerships there and also one important one is with the NHS. As you know the NHS also celebrated its 75th anniversary year as well as our tenth anniversary. And I wondered if you could tell me a bit more about that relationship with Genomics England and the NHS and how we’re working together.**

Rich: Our relationship with the NHS is absolutely critical. So, as we’re thinking about what we can do to enable better genomic healthcare we’re so fortunate in this country to have a national healthcare system. And for us and for our work at Genomics England it’s absolutely critical to work hand in hand with NHS England both in supporting their live clinical services so we enable their national whole genome sequencing service through the Genomic Medicine Service and also as we work through all of our patient facing research.

So, as we did for the 100,000 Genomes Project, as we are for our Newborn Genomes Programme and so forth co-designing these programmes so that the evidence that we’re able to generate is relevant in the UK for our healthcare system but also that national scale is just so extraordinarily powerful. And I think we’re really lucky for many reasons, the UK genomics ecosystem, it’s richness, the investment that has come from government and from the NHS in genomics and the recognition of its importance and from funders, and then that ability to ask questions at national scale.

And when you look internationally I think that’s the piece that people are often most jealous of in terms of the power of the questions that we can ask together with the NHS so that we can do exactly what we want to do which is transform care so that it’s better in the future.

**Naimah:** **Rich highlighted the importance of our relationship with the NHS in transforming patient care. Louise Fish, CEO of Genetic Alliance UK commented on the importance of joined up care following diagnosis to support them throughout their lives.**

 “So, there is a lot more we need to do to work with the NHS to make sure that the care from the health service is joined up and co-ordinated for people. And then beyond that how does the co-ordination reach out to education, to housing, to benefits, to social care. The bit that almost should be simplest is if the NHS has someone who understands your child’s condition. But it should be possible for their school to be in touch and to find out how that condition is going to affect them and what support the school might need to put in place through an education health and care plan, but those links out to the other services aren’t there either.

So, for us there is a lot of work to do that’s not just around the diagnosis but it’s about ensuring that lifelong care and support is delivered in a co-ordinated way. And as more people are getting genetic diagnosis through this amazing, kind of, clinical advances how do we make sure there is also investment into the clinical services that are going to support people throughout their lives.”

**Naimah:** **One of the key factors in supporting Genomics England to deliver this important work and all of our initiatives is the participants and the trust that they have in us. I wondered if you could share a bit more on this, so how Genomics England works with their participant panel.**

Rich: Yes, so I think one of the things I’m proudest about at Genomics England and it was established about the time I was arriving at the organisation is the participant panel who are a group of our participants who represent a broader participant across the national genomic research library. And they’re a part of our governance, which governance sounds like a boring word, our relationship with the participant panel and their role in our governance is absolutely critical. They are the people whose data we are the custodians of, and we have a responsibility to them to live up to their expectations and also to make sure that they’re driving the decisions that we’re making.

An example is how we setup the access to data for researchers. So, I mentioned that the way the national genomic research library works and a model that we developed through engagement with the public and with the input of our participants is that people can visit the de-identified data in our trusted research environment, but they can’t take it away. They come and look at the data, they carry out their research which is on approved projects that is exploring healthcare questions. Those researchers have to go through an access process overseen by an independent access review committee that has our participants on it. So, they are making the decisions about the sort of research that they are comfortable with and that they want to be done on their data, and I think that’s really critical.

It has also been a real pleasure to work with our participants as we design future programmes either on for example finding further answers or looking for better treatments for people who are already in the national genomic research library, already a part of our participants or to help us design future programmes, for example our Newborn Genomes Programme. Our participants as well as engagement with potential future participants and the public more broadly has been absolutely critical in guiding us on how we do that.

It’s a team sport what we’re doing in many different ways. That’s with our broader ecosystem, it’s with our participants, and that means this isn’t about some people going away and sort of thinking up what sounds like the right programme and using all of their knowledge and expertise and producing something which is set in stone. This is about dialogue and engagement and using that to understand the right way of us approaching the questions we are and responding to what we hear. And our participant panel are absolutely critical in that.

**Naimah:** **And maybe it would be good now to discuss a bit about the new challenges that we’re currently facing such as AI and issues with data sharing and data protection. Can you comment a bit on that.**

Rich: Yeah, so genomics is a fast moving area. We’re really proud of the impact that we’ve had already, but we also recognise that at the moment we can only use genomics in a particular number of clinical situations. And even within those we can only help a certain proportion of patients. And what our participants say to us is that we need to be restless if you like and not accept where we are today. I think it’s quite easy to merely celebrate progress but it’s really important to also then ask where we need to be going next. I’m always guided by our participants thinking about what the new technologies are and what the different ways of approaching these scientific questions is critical.

We’re in an extraordinary time, genomic technology has changed enormously. The power to analyse genomic data has changed enormously. These are big changes in terms of the sorts of analytics that AI could bring and the potential to work not just within the UK but with other countries and other big initiatives to make sure that we’re answering the questions as best we can. That brings with it as with all of these areas questions about how you best do things and how you balance the importance of privacy, data privacy, with the benefits of being able to look across larger number of research participants to find answers that you just wouldn’t otherwise.

Likewise with AI there is the potential for us to both speed up current processes but also ask broader questions that we can’t yet using some of these technologies. Doing that in conversation with our participants and the public to understand how to best balance the different benefits and also clarify where there are, sort of, very clear expectations that we shouldn’t exceed is really important.

And I think that’s one of the things that puts us in such a strong position is that confidence that our participants are guiding us and often, and speaking as a doctor myself, it’s interesting the medical community is often quite paternalistic, quite cautious and quite narrow in what they might think their participants would want. What we like to do is be driven by what our participants want and expect, and I think that has been really important for us in our history up to now as an organisation and increasingly in the future.

**Naimah:** **Yeah, and I think you’ve really highlighted how Genomics England were trying to keep the participants at the heart of everything that we do. Dr Nicola Byrne, the National Data Guardian for health and adult social care in England spoke about challenges with sharing health data and the importance of transparency and accountability in how data is used to support better outcomes from health and care services.**

“So, it’s absolutely important that people feel that they can share that information and then feel confident that any information they do share is going to be used in ways that are safe, appropriate and ethical. Whether that’s for their own care or thinking about the benefit of other people in future through research, innovation and planning.”

**Naimah:** **Well, let’s get back to the interview for some final reflections with Rich. So, we’ve been looking back at our achievements over the last ten years, and I’ll be keen for us to look at what’s next. So, we’ve touched on it, but let’s take some time to reflect on the research that has taken place across the global genomic landscape for example and, you know, what we’ve done here at Genomics England.**

Rich: The world has changed a lot in ten years. We’ve learnt a lot ourselves as an organisation and the researchers that work with our participants data and the national genomic research library have done extraordinary work. So, to give you a flavour of the sorts of things that I guess have changed in terms of what we can enable them doing in terms of research and research work. When participants data enters the research library they’re consenting to their genomic data sitting there alongside deidentified clinical data from their longitudinal health records.

As I said through our multimodal cancer initiative we’re also now able to bring in image data for our cancer participants. And increasingly, and this is something that Matt Brown, our chief scientist, was talking a lot about at our research summit in September, was bringing in additional modalities of data alongside that.

So, for example, in our rare disease participants bringing in proteomic, transcriptomic and long read data alongside the current sets of data. It means that that resource becomes even more powerful and able to answer a broader set of questions and able to ask questions across a broader set of data in terms of what might be useful for improving the understanding of medical conditions and improving clinical care.

So, for example, there has been amazing work over the last few years on cancer and the mutational signatures that are there in tumours. For example, Serena Nik-Zainal’s group understanding the patterns of mutation that are there in tumours driven by the underlying biology, not just because it helps us understand how things have happened, but also because it helps us understand about prognosis and how to treat conditions.

We’ve got really exciting early insights from the work on the image data, that multimodal data, working as I said with academia and also looking at the work that insitro are doing. Recognising patterns between you can see down the microscope of a tumour and the genomics. To understand some of those processes that we’ve just not been in a position to explore before.

And I think one of the really powerful pieces of work that is ongoing and will continue to is the ability for researchers and teams within Genomics England to continue to look for answers as our knowledge improves. So, some of the research work that we’re doing is discovering some new fields if you like of understanding. We also know that each year literally hundreds of new genes linked to rare conditions are identified.

So, enabling research that allows us to go back and look in our existing participants data to see if that new knowledge, that new knowledge about gene to condition links or better understanding of genomic variation means that we can keep looking for and finding things relevant to people who at the moment are research studies, 100,000 Genomes Project, or the Genomic Medicine Service initial testing with today’s knowledge or the knowledge of today or whenever their test was couldn’t identify because of the limitations of knowledge.

Now we can go back and identify through by sharing likely insights of clinical importance with NHS laboratories. We can then pass those findings back to participants and that has been the case in more than 2,000 of our 100,000 Genomes participants already and it’s enormously powerful. I think as we think about the direction of travel in the future, I think thinking about how we make sure that the breadth of questions that can be addressed for our participants in the national genomic research library is even broader, is really important. And that’s, as I say, something that’s particularly bringing in other types of data alongside has been a really important part of.

We’re also looking to the future where as I say we’re proud of the impact that there already has been, and the NHS Genomic Medicine Service is the first national healthcare system to offer whole genome sequencing and that is extraordinary. Thinking about how we can broaden our impact is a really important part of that, and that’s thinking about how we can be supportive of genomic technologies broader than just whole genome. So, for example, panel and exome data and thinking about some of those other modalities of data like transcriptomes is really important as well for us. And that’s something that we’re exploring at the moment how we best do that, how we might do that.

Also thinking about the range of settings that genomics is currently playing a role and we can see a future in five to ten years’ time where rather than genomics being something where it plays a role in a small proportion of healthcare encounters where it could be impactful, over a much larger proportion, perhaps even up to a half of all healthcare encounters through, for example, pharmacogenomics potentially. And our Newborn Genome Programme is developing evidence that will help us understand whether that whole genome sequencing should be offered to all newborns. Potentially in research studies like Our Future Health are asking questions around the value of integrated or polygenic risk scores.

Through those sorts of elements we can see genomics playing a role much more broadly both in terms of the number, proportion of clinical settings where it’s relevant, much more towards it being a routine part of healthcare, but also across the lifetime at different stages and thinking about the value of genomic data if you like through the life course as something that can be looked at repeatedly increasingly without requiring specialist knowledge from the clinical teams so that it can have the impact it can. And thinking about how we might play a role in developing that evidence but also supporting the infrastructure through our expert knowledge in the management of coherent national genomic data sets.

And also having that dialogue in public about how genomic data might be used and working out how we generate evidence that can drive policy change. I think there is enormous potential in the future and we in the UK I think remain uniquely placed to explore those sorts of questions.

**Naimah:** **So, we’ll wrap up there and that brings us to the end of our podcast for 2023. Thanks to Rich Scott for sharing his reflections on the last ten years of Genomics England and his aspirations for the future. Moving into the new year we’ll leave you with a powerful quote from our podcast with Dr Francis Collins who is renowned for his landmark discoveries and leadership in the Human Genome Project.**

“My dream Chris is that we come up with in the next decade a scalable approach to every genetic disease where you know the mutation.”

 **You can find all of the podcast episodes mentioned in this podcast plus many more on our website** [**www.genomicsengland.co.uk**](http://www.genomicsengland.co.uk) **or on your favourite podcast app. We look forward to bringing you some new episodes with more exciting guests in the New Year but do get in touch if you have any topics you would like us to cover. I’ve been your host Naimah Callachand, and this episode was edited by Mark Kendrick at Ventoux Digital. Thank you for listening.**