**How can we ensure equitable access in genomic medicine?**

**Behind the Genes Transcript**

**Niharika:** People are usually comfortable giving their data when they feel that there is transparency from the data collector, they’re being completely transparent, they come with you with clear benefits, how it’s going to benefit the community. And you are equally sort of agent of your own data and you feel involved in the research and you feel that you have power to give out your data and have control over the journey of that research.

**Naimah: My name is Naimah Callachand, and I’m the Head of Product Engagement and Growth at Genomics England. On today’s episode, I’m joined by Maili Raven-Adams, researcher in bioethics and policy at Nuffield Council on Bioethics, Niharika Batra, Community Projects Manager for Southall Community Alliance, and Trupti Patel, Policy Manager at Genomics England. Today, we’re going to be discussing some of the ethical, legal and social implications of genomics research for diverse communities, and how we might overcome them to address the challenge of diverse communities health needs. If you enjoy today’s episode, we’d love your support, please like, share and rate us on wherever you listen to your podcasts. First of all, I’m going to ask each of our guests to briefly introduce themselves.**

**Maili:** I’m Maili Raven-Adams, I lead on work at the Nuffield Council on Bioethics to do with genomics. This has predominantly been looking at how to develop a best practice approach for genomics, and looking at the ethical implications of AI and genomics when they’re used together in healthcare. Before here, I worked at the Global Alliance for Genomics and Health, where I developed policies related to diversity in datasets and genomic discrimination, so I have a particular interest in this area.

**Naimah: Niharika, can we come to you?**

**Niharika:** Hello, everyone, I’m Niharika Batra, I’m the Community Projects Manager at Southall Community Alliance. We are a charity based in Southall. Prior to joining the charity, I was working as a Youth Community Engagement Assistant in United Nations Development Programme in India, and I have a background in gender and development. I also bring with me lived experience of being a South Asian immigrant woman, and I’m really passionate about working with the immigrant communities in the UK.

**Naimah: It’s lovely to have you. And Trupti, can we come to you?**

**Trupti:** Hi, I’m Trupti Patel, I’m a Policy Manager at Genomics England. I work primarily within the diverse data initiative and I lead the equity in health research workstream. My background is in responsible research and innovation, as well as co-production, and more ethical ways in which members of the public can shape the direction of scientific advancements.

**Naimah: So, first of all, Trupti, can we talk about the challenges around equity in data, and what this means for diverse groups in the context of genomics?**

**Trupti:** Yes, as I mentioned, I lead the equity in health research workstream. Now we talk very specifically about equity in health data. As Genomics England, we are a biobank, and we hold health data on individuals who have consented to be a part of genomic research. When we talk about equity, primarily we’re talking about those of non-European ancestry, and there are very specific reasons as to why that is. So firstly, there’s a wider issue about representativeness within health datasets more widely. We know that across all health data sets that are located within Global North countries, the data held within them tends to not be representative of their populations. And what I mean by that is that they tend to overrepresent those of European ancestry, and underrepresent anyone who is not of European ancestry. The consequences of this is that healthcare innovation might stand to leave these population groups behind.

One of the other reasons that we talk about equity specifically, as opposed to things like equality, is that we’re also aware that if we look at research on a global level, the majority of research funding is given out through grant bodies located in Global North countries. So we already know that research portfolios can actually be quite skewed towards population groups who live in those countries themselves. We know that there’s a lack of financial investment as well within developing economies. So it’s natural to assume that health innovation projects which address the needs of these communities are more likely to be conducted by researchers who are based in developing economies. However, their access to funding is very limited, and on top of that they tend to have much smaller life sciences sectors, so their access for private funding, as well as opportunities to collaborate with industry can actually be quite limited in itself as well.

Another reason that we care about equity is that we actually know that there are some sub-populations that are very diverse within themselves. So a good example is the genetic diversity of Africa as a whole is much larger than those who live outside of Africa itself. And for that reason there tends to be a focus on actually oversampling from people who are of these ancestries. And another example being South East Asians as well. The final challenge when it comes to equity is that we also know that there has to be a need for medical innovation for these population groups, and a desire for people to actually buy this type of innovation. So there’s a need for demand for these therapies and medications. Now if we already know that developing economies might be less likely to be able to afford these medications, then the demand will always be lower for these population groups. And therefore the demand for innovation might also be lower population groups. But as a country, because we would want to make sure that we’re able to provide medication to everyone equally, we need to take an equitable approach.

So one thing about the lack of diversity within datasets actually means that we can’t always accurately predict whether or not someone does or doesn’t have a condition. So we’re still at the stage where accuracy is not as good for these population groups as it is for others, and it leads to things that we call false positives and false negatives. So where we think that someone does or doesn’t have a condition, and in fact, they might or they might now. The incidence rates of that happening for anyone of non-European ancestry are higher. That’s one of the tensions that we’re playing with at the moment, especially when it comes to providing genomic healthcare via a healthcare service. Understanding people’s cultural background and nuances I think is really important. For example, a lot of those cultural practices can actually play into whether or not someone decides to receive or not receive a form of healthcare. And it’s also important to understand things like timing, so the decision around whether or not someone decides whether or not they’re going to take a preventative medication might be based upon cultural timings around things like giving birth or something.

**Naimah: How can we ensure equitable access to genomic medicine for all of these communities?**

**Maili:** So I think we need to understand that there are several understandable reasons that people might not have been involved in genomic research to date. Efforts have been made to engage with different communities, but this has sort of been piecemeal and we need to see how that engagement can feed into research practices. So that people feel as if their information that they’ve given has been taken on board, and that those research practices have been co-developed, and they feel more willing to engage so that that representation can increase. There’s also been examples where research has been actively untrustworthy in the past. You know, there’s well known stories of Henrietta Lacks, whose cancer cells were taken without her consent, and then used to develop research. And there’s different examples across the globe that kind of mirror that sort of exploitation. So we kind of need to take note of these, and understand why people aren’t there, and then allow that to inform engagement practices. So that research practice can change over time and be more inclusive and encourage people to get involved and give good reason for them to get involved in that.

**Niharika:** Also, to add on to what Trupti and Maili mentioned. First of all, why this data gap exists, why is there inequity in genomic data? It’s because historically South Asian communities or the marginalised communities have been used to extract a lot of data, be it social research or medicine research. So when a researcher approached them or a data collector approaches them, they feel that they’re just going to collect the data and there will be no feedback process, or it might not benefit the community. The communities do not understand what the clear benefits of these researches are. And in terms of genomics, when we talk about medicine research, historically these communities have been exploited. There has been information asymmetry, and we have observed a case in 1960s where in Coventry Punjabi women, or South Asian women, were given radioactive rotis, and they weren’t even aware what they were consuming. And it was in the name of research. So there’s always this hesitancy when it comes to medicine research.

One way to tackle the problem of the data gap in genomic research is by co-production . So when you're approaching the communities, it sort of helps who is collecting the data, there is no skewed power dynamic involved. People are usually comfortable giving their data when they feel that there is transparency from the data collector, they are being completely transparent, they come with you with clear benefits, how it’s going to benefit the community. And you are equally sort of agent of your own data, and you feel involved in the research, and you feel that you have power to give out your data and have control over the journey of that research.

So it is also important how you frame the message when you're collecting the data. In our communities, the idea of sevā or Kismet is very embedded in the communities, which mean either giving out your services or your time for the benefit of the communities. So it’s not just donation, but it’s just spending more time or just working with the communities for a common or a collective benefit. So when the message is framed in such a manner that you are doing a sevā or you are helping your communities bridge the health inequalities and there might be a collective benefit for the communities, people are more motivated to give their data. But when the word donating data is used, then it puts a sort of emotional burden on the participant. So it all depends on the messaging, how you frame your messages when you're collecting the data, and it’s important to be cognisant of the cultural sort of ideas. And this is something that can be used with South Asian communities, sevā and giving back to the communities.

**Maili:** I was just going to say, I completely agree with that, like 100%, it’s really important as well that the global majority don’t feel pressurised into giving that data because of the language that’s being used. You know, the global majority are not represented in these datasets, so it could be that the language used might put pressure on people to donate that data to fill that gap, but that’s not the right language. I think it is about finding language to involve people, and figure out how the benefits of them donating data can relate to them and their community, so it just wanted to say that. And also, it’s important when we’re using language like genetic ancestry that those aren’t conflated with things like race or ethnicity, which are social uses of that language. So I think this is just another area where it is really important to think about language and work with communities, to figure out what the right language to use it, and understand the benefits of using certain types of language.

**Naimah: And it just kind of highlights how many different nuances there is, and areas that need to be considered.**

**Maili:** Yes, I was just going to say, within that, we need to think about barriers to participation as well that might affect certain communities. You know, there might be some language barriers, to making sure that we’ve got translators, or there’s investment in making sure that the resources are there to make the engagement and also the research accessible to people. There’s things like people have lives, they have childcare, they have jobs, so making sure that they can donate data if they want to, at times that work for them and environments that work for them. And things like transport costs and that sort of thing might be covered by a research organisation, so that people are empowered to get involved, and there’s not too many barriers to become involved if they want to be. I think that’s really important to address as well.

**Naimah: Trupti, did you have something to add?**

**Trupti:** Yes, I was just going to say, I think it was really interesting that Niharika actually framed the benefit around community benefit. Because within the policy sphere, and actually even within wider conversations on data and health, people use frame benefit in terms of patient benefit specifically. And what we find is that when we engage with diverse communities, most of their concerns around harms are actually not harms necessarily to themselves specifically, but harms around their whole community. And I do wonder whether there needs to be a slight reframing in how we talk about benefit when it comes to genomics in particular. Because most people when they donate their data they know that it has consequences for those who are related to them.

**Naimah: So I wanted to talk about research governance as well. And in the context of history of medical racism, with medical innovation now heading towards personalised healthcare, what are they key considerations we should have when it comes to rules around access to data?**

**Trupti:** So, I mean, one of the rules that we have within our biobank, when it comes to access to data, is that we don’t want it to lead to any discrimination, and we won't allow access for things, for research projects, that do lead to discrimination. However, we already know that there are lots of unintended consequences when it comes to research in general. And when it comes to medical research in particular, and thinking about genomics in particular, lots of communities are aware that because in the past there has been a lot of research outputs have been used in ways that actually don’t benefit these communities, and actually have negative consequences for these community groups, it means that the barrier to encourage people to take part is actually quite high. When it comes to genomics in particular, obviously there’s been a history of eugenics, and at the moment, that’s quite a big area that lots of universities, especially in the UK, are going through eugenics inquiries. It has effects upon people’s perceptions of genomics as an area, and whether or not people can be confident that those types of research won't be repeated, and the types of research that will happen will actually benefit them.

I mean, there’s a good example that one of the community members gave, not directly to do with genomics, but actually they knew that if you're first name is Mohammed, your car insurance is actually much higher, your premiums are much higher. And so they were concerned that if you were grouping people within genomic ancestries, or genetic ancestries, what consequences that has for them can be quite nuanced in the first instance. But in the long-term it would actually mean that people might be grouped within these ancestries and policies and things that are created as a consequence were quite concerning for them.

**Naimah: And Maili, I wonder if you could tell me how people might feel more comfortable in the ways in which their data is being used?**

**Maili:** I guess if there’s transparent governance mechanisms in place and they can understand how their data is being protected, you know, that goes right through data access committees. There’s one at Genomics England that as Trupti said reviews data. So if they can understand what sorts of considerations that committee are thinking about in respect to genetic discrimination, and they can understand that certain considerations have been taken into account when their data is being used, that’s one thing. Another could be through consent processes. So there’s different sorts of consent models that could be explored with communities to figure out which one they’d be more comfortable with. So broad consent I think is the one that’s used at Genomics England at the moment. So that means that people give their consent once, and then that data can kind of be used for a broad range of purposes. But it’s not always clear to people what those purposes are, or where that might be used over time.

So there’s different sorts of mechanisms that could be explored, like dynamic consent, where people are updated over time about what their data is being used for, and they can either opt out or opt in to those research practices. Or forms like things like granular consent, where when people give their consent there’s different options of people that they’d be happy for their data to be shared with. So we know that people are less trusting of private companies, for example, so people might be able to say, “Yes, my data can be shared with nonprofit organisations or research organisations affiliated with universities or the government, but I don’t want my data to be shared with private companies.” And that might make people feel more comfortable in donating their data, because they might feel like they have some more control over where that is ending up. And I think transparency there is really important, so people can understand when they give their data or they donate their data, they can understand what benefit might be coming from that. And that might encourage people to get involved as well.

**Trupti:** I was just going to add to that comment about dynamic consent. So actually an interesting thing that Niharika mentioned earlier was this feeling that the people that we engage with actually really wanted a sense of control over their own data still. Obviously when you give broad consent, your giving your consent, as Maili said, to a wide range of research that will happen or can happen in the future. But interestingly, dynamic consent, I think culturally it is really valuable for some population groups, partly because it fits in very nicely with the idea that your biological data is actually a part of who you are. And that cultural philosophy can still exist within a lot of these communities that we’re engaging with and a lot of these communities that we’re trying to encourage to actually provide us with data. Do you ever think that there could be like a medium position, where it was actually dynamic withdrawal?

**Maili:** Yes, I guess that is something that could be explored, and I think that’s one of the models that sometimes is talked about in academia or in these sorts of forums. I think if people were dynamically kind of withdrawing, it might be interesting to understand why they’re withdrawing and their reasons for that, so that research practice can change and take account of why people maybe no longer want to get involved in a certain type of research. And I know that’s something that you’ve spoken about in your community engagement groups.

**Naimah: Niharika, do you have something you want to add?**

**Niharika:** Yes, so when we were engaging with our communities, we primarily engaged with Hindi speaking people from Indian origin, Punjabi speaking people from Indian origin, and Urdu speaking people from Indian origin, and we spoke to them about genomic research. We also spoke to them about the branches of genomic research and how their data could be used. So while their data could be used for innovation in pharmacogenomics, which seemed to be more palatable for the people as this is an extension for treatments they’ve already been using. For example, treatment for a chronic condition like hypertension or diabetes. Whereas they were quite reluctant when it came to their data being used for gene editing. So in Hindu religion, humans are considered the creation of Brahma, who is one of our main Gods. And similarly in Islam, humans are called (Islamic term), which means God’s greatest creation. So when it comes to gene editing, some people believe that it means you are playing God, it means that you're tampering with the DNA, you're tampering with God’s creation. So they were really reluctant in providing their data for an innovation that entails gene editing or genetic screening or gene therapy.

And when it comes to consent, I know Genomics England takes a broad consent, and there’s scope of dynamic consent. Where people are constantly engaged on where their data is being used, how their data is being used, which innovation their data is being used for, which research their data is being used for. And they have an opportunity to withdraw their data if they’re uncomfortable with any aspect of research.

**Maili:** I was just going to say something else about consent models. When we’re thinking about different forms of consent, like dynamic consent, it’s also important to consider the accessibility of those, lots of those models would rely on the internet and people having access to laptops or phones. And so when we’re exploring those models, we need to make sure that people have access, and if they don’t have access that there’s other ways that that sort of consent model might be able to be replicated, or there is an alternative way, so that people aren’t excluded through that.

**Naimah: Is there a question around language barriers as well with the consent models?**

**Maili:** Yes, when verbal consent is taking place, the same problems of language barriers are there within the online version. You know, how do you make sure that things that are translated, and translated well as well? Because genomics is a complicated area with lots of jargon and complex language. So how can we make sure that we translate that language in a way that’s done, where the meaning is kind of translated as well.

**Trupti:** The language thing was something that came up within some of our community workshops. And I think one of the things that really came out was that genomics research itself has so much technical language that often you simply cannot translate the word into other languages. And different ways in which you can convey information, so that you're still making sure that you're getting informed consent from participants I think is really important for these groups, beyond simply translating written material. Whether that’s through analogies or visuals that convey information, I think that’s quite an underexplored area actually, within research more generally, but as a starting point genomics.

**Naimah: And did any of those community groups identify any preferences for what way they wanted to be communicated with, for consent and things like that?**

**Trupti:** I mean, certainly having online consent was a huge barrier. So the idea that you log into a platform online in order to provide your consent to something wasn’t something that people were that comfortable with. Especially since these participants are often very reluctant to take part in the first place, so you're almost creating a barrier to them as well, it’s an extra thing that they have to do. They did feel that consent should really be in person. They also preferred the idea of being able to discuss genomics widely within less formal settings, so outside of healthcare settings, or outside of research settings. Because it meant that they felt that they were primed for the questions that they might have.

One of the things that I was going to add is actually for genomics in particular, I mean, I mentioned before about when people decide whether or not they would like to consent to take part in genomic research.. They feel like they’re not just consenting for themselves, they’re also consenting for people within their network. And so these are people that they would consult probably as to whether or not they should or shouldn’t take part. And so when you are making that decision and you're having those consenting conversations, whether that be within a research setting or a healthcare setting, it’s important I think for people to understand that those decisions have been taken not just by an individual, they are actually reaching out to a much wider range of people within their own communities.

**Naimah: And is there something around that these decisions are often made with family members as well?**

**Trupti:** Yes. So in situations where there are people from some cultures who are much more likely to take part in cousin marriages, these particular populations have scientifically been shown to have much higher likelihood to develop genetic conditions. Now if that is the case, that can lead to a lot of stigmatisation, and it can proliferate a lot of discrimination that these population groups might be facing already. So I think that’s something to be considerate of. And it might influence their decision making as to whether or not they or their family members should or shouldn’t take part.

**Niharika:** Yes, just to add onto what Trupti and Maili actually said, while language plays a very important role in terms of consent, how consent is being taken, it also depends on the setting. In our areas where we engage with communities, usually the consent, or consent regarding medical research or genomic research is taken via the GPs. And the GP services here in our areas are so overwhelmed at the moment, there are long waiting lists, like three months. And when people actually get through the waiting list and go to their GP, they’re so done with the process of waiting that when their GPs ask them for consent, they just either feel that they need to succumb to the pressure of, okay, giving the consent. Because there’s this skewed power dynamic over them as their white man or white doctor asking for the consent. But also, they don’t know what exactly to do in that moment, they’re very frustrating from the long waiting line. And they feel they’re okay, they might need a little time to sort of cool down, go back home, look at the consent form, what is it about?

And in South Asian settings usually the decision making is done in family setting, where you consult your families. And when we spoke to older South Asian women and asked them how would they give their data and why would they give data, they mentioned that they would give data because their children or husbands have advised them to do so. So yes, it’s important to see the setting of where the consent is being taken, who is taking the consent, and if they have enough time to think about it and go back and give their consent. Also, it came up during the workshops that it helps if the consent is being taken by someone the communities already trust. So having accredited community champions seek the consent. So once they’re trained, once they have enough knowledge about genomic research and how it can benefit their communities, they’re able to better bridge the gap between the researchers or the research organisations and the communities.

**Maili:** Yes, I completely agree. And I was just going to add that it’s important that healthcare professionals are properly informed and open and aware of those different cultural or contextual dynamics within those consenting conversations. So that they can properly listen and understand where people are coming from and give that time. And I get that that’s difficult in pressurised situations, where healthcare professionals are under a lot of time pressure. But that needs to really be built into that healthcare professional training over time so that carries on and people can talk about genomics in a really accessible way. And that carries through as well to genetic counsellors who give results to families, they need to be able to do that in the right sort of way. And they need to ask the right questions and understand the patient that they’re talking with so that that information can be translated or got across in the best possible way.

And that’s even more important I think where there is a lack of diverse data that’s informing research and informing healthcare outcomes. I think healthcare professionals should be transparent with patients about some of the accuracy of certain things or how different results might mean different things for different people. And it’s really important that those conversations are had very openly and for that to happen, healthcare professionals also need to get the training to be able to do that.

**Naimah: Okay. So we’re going to move on to talk a bit about developing countries. Niharika, I wanted to come to you for this question. Why would diverse communities benefit from research being more collaborative with developing countries?**

**Niharika:** So in recent times, we have witnessed growing diaspora in the UK. And when it comes to collaboration with developing countries, there’s increased collaboration with these developing countries. It can be a win-win situation for both the countries, for example, there can be increased innovation for these developing countries in exchange of information. And at the same time, people in the developing countries, if they provide their data, they have the sense that they are helping their own communities who are living abroad.

**Naimah: You’ve touched on a few points already, but, Trupti, I wonder if you could talk about the considerations we should have when considering international partnerships?**

**Trupti:** Yes. So one of the things that Genomics England has tried to do in the past and is still trying to do is increase the number of international academics that can have access to our biobank. Now we already know that internationally, especially in developing economies, there’s often a lack of data purely because the resource to do things like whole genome sequencing is so expensive. The resource to even have or host a biobank itself is so costly that the barrier to even developing the infrastructure is so high. So one way that we’re looking to encourage innovation within those settings is actually to allow access through particular partnership agreements to academics who are based abroad. Now obviously that means that there’s a benefit for them in terms of being able to do the research in the first place. But one of the things is that as a biobank we’re also known for being a very highly secure biobank, compared to others. So that’s something that as a data store people actually highly respect, and in particular, a lot of the data regulation within the UK is highly respected by other countries.

One of the things that we have seen happening recently is that essentially some of our data security laws and data protection regulations are being reproduced in other countries as a way to ease working with research datasets across geographic political boundaries. When it came to engaging members of local primary communities they have three primary asks when it came to the international partnerships that we might be developing in the future. One of them was that at the very least there would be tiered pricing. If we ever came to a situation where we were charging for access to our data, that pricing should be tiered to address the fact that if you are someone based in a developing economy, your access to financial resource to do research is much lower.

The second ask was that there’d be some way for us to foster collaborations. Now, whether that be led by an academic who is based abroad or an academic based in the UK was up for debate. It was more that those collaborations have to continue and have to be enabled in some capacity. And then the third thing that was a big ask was actually around IP sharing. So what happens to the financial benefits of doing this type of research? And also, more equitable basically knowledge sharing across these regions was what was asked. So what we’re looking at in the near future is whether or not these principles could be used in order to guide some of our international partnerships’ work.

**Naimah: And I think just on that point you raised about fostering collaborations, Maili, I wonder if you could comment on how we could foster collaborations between the researchers and the communities that they serve?**

**Maili:** Yes. I think here is when engagement is really important, and we need to get researchers and communities speaking to each other, to have some sort of meaningful dialogue that doesn’t just happen once but is embedded into whole research practices. So there’s many different opportunities to feed in and that practice is shaped based on the feedback the researchers receive. I think engagement is a really amazing thing, but it does need to be done well, and there needs to be clear outcomes from that engagement. So people need to feel that the information that they’re giving and the time that they’re giving is respected, and that those practices do change as a result of that. So I think we really need to make sure that engagement and practices are done well. And I was just going to say something on collaboration between different researchers. When researches are happening across borders, it’s really important that that’s done in a really equitable way, and that those conversations are had between different researchers to figure out what’s going to work well.

We need to avoid instances of things like helicopter science, and sometimes it’s called other things. Where researchers for example from the UK would go into a developing country and undertake research and then leave, taking all the benefits with them and not sharing them. And that’s something that we really need to avoid, especially in the UK, we don’t want to exacerbate colonial pasts. And I think it's really important in this context that those benefits are shared with communities. And again, we can do that through engagement and understanding that relationship and making sure that collaboration really is collaboration, and that we can provide things that maybe others need or want in the right sort of way.

**Niharika:** Just to reiterate our communities are still haunted by the colonial pasts. There’s always this constant fear that our data might be misused, there might be data breaches and we won't be protected. And your DNA data contains a lot of personal information, so there’s constant anxiety around your DNA or genetic data. So it’s important that the researchers maintain utmost transparency. There’s a constant focus on flattening the hierarchies, where you sort of bridge the power gap between the researchers and the communities. And it can be done through, again, as I mentioned before, having community champions on board who understand the communities better, who are constantly in touch with the communities. And they provide that sort of semi-formal settings, where they know that where they’re in constant touch with the authorities or the GPs or NHS, but also at the same time have very good relationship with the communities. So this is something that should be taken into consideration. And then just be cognisant of the cultural values, and not have very imperial ideas when you sort of approach communities.

**Maili:** I think this becomes even more important as genomics continues to evolve and new genomic techniques are developing. For example, with things like polygenic scores, where we can look at people’s genomic data and predict how susceptible someone might be to developing a certain disease or trait or outcome, in relation to the rest of the population. Those are developing, and people are interested in them, but the data that they’re based off again is that European genetic ancestry data, and therefore is not accurate or applicable to lots of communities. And it’s not just genes that we need to be aware of, it’s people’s environments, and that data is really important to integrate with things like polygenic scores. I think we need to really address these issues now and make sure that as genomics develops that these things aren’t perpetuated and existing health inequalities aren’t continued to be exacerbated.

**Naimah: Okay, we’ll wrap up there. Thank you to our guests, Maili Raven-Adams, Niharika Batra and Trupti Patel, for joining me today as we discussed the ethical, legal and social implications of genomics research for diverse communities. If you’d like to hear more like this, please subscribe to Behind the Genes on your favourite podcast app. Thank you for listening. I’ve been your host and producer, Naimah Callachand, and this podcast was edited by Bill Griffin at Ventoux Digital.**