**Centre for Personalised Medicine podcast**

**Season 3 Episode 2**

***Risk and prevention in personalised medicine***

****

(Our podcast logo features a section of the artwork [‘A Lifetime of Measures’ by Aneesa, aged 12, from Oxford High School](https://cpm.ox.ac.uk/centre-for-personalised-medicine-art-competition-2022-23/), the stunning winning entry to our 2022-23 Youth Art Competition).

**SPEAKERS**

Rachel Horton, Anneke Lucassen, Sally Sansom, Louisa Chenciner, Malte Gerhold

**Rachel Horton**

Hi, I'm Rachel Horton, a Junior Research Fellow at the Centre for Personalised Medicine, or CPM. Welcome to the third series of the CPM podcast where we're going to be exploring aspects of our new ten year strategy. In this episode, we're focusing on risk and prevention in personalised medicine. Joining me to discuss it, I've got several of us from the CPM team.

**Anneke Lucassen**

My name’s Anneke Lucassen, and I'm Director of the Centre for Personalised Medicine. I'm also an NHS consultant in clinical genetics.

**Sally Sansom**

Hi, I'm Sally Sansom. I'm a research fellow at the Centre for Personalised Medicine, and I'm also a health economist within the Health Economics Research Centre at the University of Oxford.

**Louisa Chenciner**

Hi, I'm Louisa Chenciner. I'm a public health doctor and junior research fellow at the Centre for Personalised Medicine.

**Rachel Horton**

We're also delighted to be joined by Dr Malte Gerhold, Director of Innovation and Improvement at the Health Foundation. Malte, please could you tell us a bit about your work at the Health Foundation?

**Malte Gerhold**

Thank you, Rachel, I’m delighted to join you today. The Health Foundation is a charitable foundation, and our purpose is to support and improve the health and health care of people in the UK. We do a large range of things, but most relevant for the discussion today is the work that we're doing on supporting, sometimes directly through grant funding and active engagement, how the NHS can change and how it can change through innovation and technology.

**Rachel Horton**

And the Health Foundation's very recently written a briefing on personalised prevention. Can I ask what inspired you to focus on that?

**Malte Gerhold**

We've been doing a lot of work recently on the opportunities that arise from technology-enabled change in the NHS to address the really big challenges that the NHS is facing, whether that's in terms of the workforce shortages, in terms of the financial constraints, or in terms of the pressures of demand from the population.

And in that context, the question of how you can improve prevention, and what difference technology today is making to the idea of prevention and more personalised approaches to prevention, has triggered this particular research that we started.

**Rachel Horton**

And just to sort of throw the question out there to everyone,

what does personalised prevention conjure up to you? What sort of things does it make you think of? What sort of initiatives come to mind?

**Malte Gerhold**

My starting point, Rachel is… and I'd be interested to hear from panel colleagues, to some extent, medicine, and treatment, have been personalised for a very, very, very long time. So if someone is being prescribed a particular medication, we know in general that this medication works with this sort of thing, but actually, the doctor doing the prescribing will look at the individual circumstances of you as a person and say, “this is the right dose, or this is the right combination of drugs”. Similarly, where people receive treatment or otherwise.

We're also really personalising treatment when we say to people, you are at particular risk of a condition, for example, because you've had it in your family, and so we’re more likely to screen you at a certain point for the for risk of cancer, for example.

So at the heart of it is the idea that we can use information about an individual or about a population to much better tailor how we support them, or how we identify issues, to treat them or to improve their health. I think what makes the biggest difference right now, is how new technology and data is enabling a step up in what that tailoring towards individual circumstances means, I think. And I'd be interested to hear from others, of how exactly sort of data or science and technology at the moment does that.

**Anneke Lucassen**

Following up that really interesting comment from you, Malte, I think it's really interesting, isn't it, how we're talking about how data and new technologies can enhance personalised prevention. But what's missing in that conversation quite often is that to enhance *personalised* prevention, we need something very specific about a person. And the more data we create, the more we might be able to detect things, but not necessarily in a very specific way, so the more noise we also create.

And I think that bit of the discussion is often missing. There's often huge ambitions for data and new technology, particularly genomic technology, which, in my clinical role, I get exposed to a lot, a real hope that that will now say, “Ah, this asymptomatic person is going to get that particular disease at this particular time, and here's a particular intervention we can offer them”. I think it's really important that we have a look at that rhetoric, because there are a lot of

unrealistic expectations in that rhetoric.

**Louisa Chenciner**

I think those are really interesting points. I mean, for me, contemporary understandings and nuance around personalised prevention seem to focus quite strongly on genetic and clinical data, and as Anneke alludes to, it's really thinking about *how* that data can be used in a way that's actually sensitive to the needs of patients and carers, and also thinking a bit about the capacity of… not just the health service, but also public health, to handle that data in sensitive way and most appropriately.

I mean I think it's interesting to consider that obviously, if we're thinking specifically about genetics, which I know that's not the only angle when we think about personalised prevention. It's not just genetics that inform risk of developing disease or illness. And from a public health perspective, you know, where people are born, where they live, where they work, informs health and wellbeing hugely. And it feels very important to me that certainly when we talk about personalised prevention in a contemporary context, we don't neglect those social determinants of health.

**Malte Gerhold**

I think it's worth… in terms of exploring of where, where those issues are that you raised there, Anneke, you know, so we disentangle a little bit where the opportunities are arriving through new data, because you mentioned sort of a few examples, and for me, it falls into sort of three or four categories that would be interesting to test.

So first of all, we've actually gotten a lot better at bringing together clinical data. You know, what used to be on paper records in a hospital, we're now digitising. We're also starting to bring together records from a hospital with a GP and with other care elements, which is all work in progress. But that's the sort of first category, because it actually allows us much better to look at that data in combination and say, “oh, what might this tell us about the particular individual in terms of how we support them, or what they might be at risk of?” in terms of a health condition.

There's then a second category that as part of that we're also getting better at beginning to explore what it means to put that clinical data together with other sociodemographic data, or wider behavioural sort of social data, which you just sort of mentioned also as a risk of how we bring that together and understand, but that's another new development, which is partly driven by the digitalisation of data, and so, to allow then to explore that.

There's a third one, probably then, which is about the increasing proliferation of devices that make it possible to measure data in our daily lives and habits, whether that's a wearable, or whether, if you are already living with a long term condition, the ability, for example, to monitor aspects of your heart or diabetes, whatever it might be, on an ongoing basis, which gives you much greater level of detail, which then again, allows that sort of tailoring to do.

And then there's a fourth category, which is that through the advancement in science, and particularly genomics, and understanding the interface between genomics and other factors about individual, and the ability to sequence genomes, et cetera, we're getting much better at using that new information that is very, very, very highly personalised to understand what implications might that have for particular treatment, or sort of a drug.

Now, if that's the sort of data sources, if you want, that allow us to do that, then there's something else I think that also really drives this debate at the moment. The first one is that digital platforms like apps are now becoming so widely and easily available for many people, if not everyone, it also means that the way we can provide this more detailed data back to people has changed significantly. You know what before would have been a big “you need to see your clinician every week to talk through an issue”. Now you can have it real time on your phone. And that gives opportunities, but also risks and question marks of whether it works on how people interact with that data, and whether that can make a difference.

And then the second sort of enabler I would sort of add, is that because we're getting so much better at data analysis, including using machine learning and also AI and sort of how we look at data, that actually we're now in a situation where we might identify issues in people's data and specific factors about individuals that previously we just wouldn't have been aware of.

I find it really interesting how, you know, why is it that we're suddenly talking about personalised prevention in a very different way, but also because I expect the risks and the issues will be very specific when we're talking about, for example, genomic data, and what that means for individuals, versus having something on their phone, versus bringing together data between your clinical record and socioeconomic data.

**Anneke Lucassen**

That’s such a helpful summary, and I completely agree that massive advances in lots of different directions that you've summarised really nicely there, Malte, have made big differences to how we think about medicine, and about personalising medicine.

I think what I'd still like to do is say there is a clear difference between using all that to *diagnose* something that's already present, and *predicting* it in the future with sufficient specificity or accuracy. I'm not quite sure what the right word to use there is. I think I want to use both.

And there I want to get at what I think is sort of implicit in this conversation that we're having about these advances, is that the NHS, or healthcare system is often very sluggish and a little bit sort of behind the curve. And I think that's certainly true for the NHS in current circumstances post pandemic, hardly a day goes by without a headline about how it's struggling. So that's a given.

But I think what's *not* true is that we can necessarily use all that data, be it, just better data collection, wearables, genomic data that we can necessarily use that to identify particular people from a population who are currently healthy, who will go on to develop something for which an intervention is available in a way that picks them out from the crowd, rather than picks a hundred people who are at risk of something who we then all need to treat and follow up for X amount of time to prevent one person from developing the disease in question.

And I think it's *that* bit that we don't have enough conversation about, about the

the *noise* that's created by screening, where we're testing, following up people, marking people at risk, who then never go on to develop the disease in question, and what the costs of that are, both personal costs for people, anxiety, worry, but also cost to a health service instigating those programmes.

And I think part of the problem there is that people do imagine that we can go from diagnosis with better data, better technology, to prediction in a sort of seamless way. And that's the bit I'd like to challenge a bit more, in general conversations that we hold about data and technology advances.

**Malte Gerhold**

That's really interesting, Anneke, and you’re referring there, in a way, to a couple of the assumptions that we've also identified. Assumptions that I think underlie a lot of the political discourse about how personalised prevention can really help the NHS.

And the first one is, well, this technology and data that we're talking about is it actually sufficiently advanced and available to begin with? And while there's been progress on all of this, we know that there's still lots more to do on digitisation, bringing data together, collecting new data, the reliability of AI algorithms, you know, put on that data.

But then, importantly, also a second one, which is to say, well, even if that technology becomes available, actually how good is the evidence that we can tailor something, or that we can narrow down the prediction of risk to individuals in a way that actually then leads to better care?

I'd be really interested to hear a bit more about, you know, how good is that evidence at the moment? Because usually what you see in the papers is the things that work, which might be quite narrow, but actually more what you know, what… overall is that, is that true?

**Anneke Lucassen**

I think that's… that's exactly what I mean, that the assumption is that it's just a question of the data collection and interrogation being sufficiently advanced, and if it isn't now, then it will be some point in the future.

But I would argue, and I think you have also argued, Malte, that even if it does advance, it doesn't allow you to pick out individuals who are currently healthy but have some biomarker or data or genetic profile that tells you, with sufficient predictive power, that *they*, and not others in the group, will go on to develop something, not only that they'll go on to develop it, but that you have an intervention to offer that changes the course of that disease.

Because I think that's a fundamental point of screening, isn't it? That we probably aren't about screening populations to tell them that at some point in the future, they'll develop an untreatable disease. So if we take that assumption that we're only trying to identify the people that we've got something to offer, and that we're trying to *not* identify people who *aren't* going to develop that condition but need to be followed up in a health service because they've been identified “at risk”, then you really narrow down the pool in which personalised prevention is likely to be helpful.

I've got very limited knowledge of AI, but I've heard it said by experts, and I think that applies to genomics data and our massive data collections in public health as well, that generative AI, you know, it may well have a role to play in making X-ray interpretation better, because you can train up sets to make them as good as senior radiologists.

But *predictive* AI is predicting the future, and that's always going to be hard to do unless you've already got some details. Like a weather forecast, you've already got some information that there's a high pressure area very nearby, so you can predict the weather tomorrow, but you can't necessarily predict the weather in two weeks time. Prediction is different to diagnosing something that's already there.

**Louisa Chenciner**

Yeah, absolutely. I wanted to touch a bit on thinking about the societies in which we are actually implementing personalised prevention. And I know that the briefing paper from the Health Foundation talks about this as well, and this concern about the risk of widening health inequality.

So particularly when we think about, for example, patients having more access to their own data, thinking about *who* that intervention is likely to most benefit, and to whom it's potentially most accessible? Obviously it assumes a level of technical literacy, but also a level of health literacy, actually, because if you have, for example, you know, reams of blood tests over time, actually interpreting that by yourself with an app requires quite a bit of knowledge and understanding and also has potential to cause a fair bit of anxiety, which may or may not be unfounded.

And there's been discussion about potentially some of these tools favouring, younger, healthier, more affluent populations. And there's a bit of debate about whether that might still free up some capacity for the NHS in the relatively short term.

I think also it's interesting to reflect on if we're thinking more about the sort of *genomic* data, obviously, being very clear about the fact that much of that genomic data is derived from white populations, and thinking about the generalisability of that data, even if we're just looking in the UK context, who that excludes within our population. So I think that equality and equity piece is very important when we're talking and thinking about personalised prevention.

**Sally Sansom**

I guess just listening to the discussion and kind of having my health economist hat on, I often wonder… given the NHS, and I think Anneke you described it as a somewhat sluggish system, and obviously there's significant capacity constraints and often antiquated systems for managing data and sharing data between different areas and also to patients.

I just wonder whether the NHS is in the best position to be delivering personalised prevention given these constraints? And I'd be really interested in others views on whether there's other models that could be explored? There's many companies, you know, maybe start-ups who have developed really deep expertise in a particular type of personalised prevention. Is there potential to partner with such companies? Ones which are not as profit-driven, but perhaps more a social enterprise type nature.

**Anneke Lucassen**

I would think that is absolutely possible. But I guess my point was to accept that the NHS is sluggish, but *not* to say that if it weren't for its sluggishness, everything would work well. I think what we first need to do is question that assumption that with new data, more joined up data together with people's own data from their wearables, etc- we have to question the assumption that that will automatically lead to better personalised prevention, because I think that conversation isn't really being held. So I hope that this podcast will at least raise the need to have that conversation.

**Malte Gerhold**

It's not obvious at the moment in what areas more tailored and individualised data, whether it's at a population level or an individual level, is most likely to help us to become better at then treating them.

And so from a sort of policymaker perspective, we're not really in a position right now to say, “Alright, we'll be able to address cardiovascular disease by doing that”, because the evidence is out there, and so we're still in a sort of experimental stage in many, many areas before we can actually start putting particular policy investment and focus behind a particular condition.

**Anneke Lucassen**

I think that's absolutely the point to make, isn't it? Of course we want policy makers to step in and facilitate precision prevention, once we've got the evidence that we can do that with all these advances. And the assumption is that the evidence must be out there somewhere, but if only we had… I don't know, a start-up company that had the money to do it, for example. And I think it's that bit that really needs a bit more scrutiny. Now, there may be some examples where it could happen, but I'm not aware of any big scale examples where we've got the evidence that we can really make that change.

**Louisa Chenciner**

I suppose it's quite important to go back to first principles, and we've got very clear principles of screening that were developed by Wilson and Jungner in the 60s that set out the criteria and the caveats for implementing a screening program.

I was going to just go back a little bit as well to Sally's original comment. I think, firstly, you know, the NHS, there is also a lot of enthusiasm and interest in trying to, you know, be innovative. And trying to adopt the principles of prevention whilst also managing really difficult demands and under-resourcing. So I think that's important to state clearly.

I think also when we think about personalised prevention, it's important to think about it not just being constrained to the National Health Service. So we know, firstly, in terms of data sources that might be really useful, there's a huge amount of data, for example, that's held by the Office of National Statistics. There's really important socioeconomic data that's held across different registries. And then also, there is, now, following on from the 2012 Health and Social Care Act, in particular, a really important statutory role of local authorities in providing aspects of prevention.

One particular example that comes to mind are NHS health checks, but just thinking that actually if we want personalised prevention to work, we *have* to think about the whole system, whole society approach. Particularly in terms of the data that we want to inform some of this risk stratification, because it's not just going to be restricted to the National Health Service.

**Sally Sansom**

I totally agree with Louisa. I think the concept of risk and prevention is… although obviously the NHS has a huge role to play in that, there's many aspects which go beyond that. And while I think screening is a really important part of risk detection, I think there's potentially another aspect of risk detection and prevention that we could be looking at. Anneke, you may define this as screening, so please let me know if I've got this wrong.

So my thinking is, instead of, you know, looking at a population and identifying “at risk” populations through a screening program, potentially, there's a role for individuals to be receiving more tailored risk information based on their characteristics. So, you know, as Louisa mentioned, maybe socioeconomic status and other factors, but also family history, and improving the *packaging* of that information, the specificity of it to a person's particular circumstances, and then the delivery of that information, you know, through an app-based system or something similar.

I think if there are evidence-based approaches available, that could be a really useful way of thinking about this that is perhaps slightly different to a population or a risk-stratified screening approach.

**Anneke Lucassen**

Yeah, that's really interesting Sally. I think I would see that in a in a pretty similar way, that using people's family history is much less specific than one might think in all but few circumstances, and the evidence out there to really tailor effectively on the basis of people's family history, I would say is more limited than you might expect.

I don't want to sound like the “Yes, but” person, because I am also enthusiastic about developments, and I think we've seen *huge* progress, for example, in genomics just over the last twenty years. So I'm not trying to dismiss that, what I'm trying to get at is that the assumption is that those developments will go hand in hand with greater specificity for individuals. And I think that's not the case. The developments go hand in hand with being able to say *more*. Granularity, perhaps, but granularity is not the same as good risk prediction. It's just more information.

But it might allow me to say, “Sally, you're in a “at risk” group for something”, but you might still only be one out of 100 who I've identified at high risk of developing this condition. And so then the question is, when do *you* start with interventions for that risk? When do you surgically remove your breasts, or start taking anti-oestrogen treatments, or have regular screening? And at what cost does that come to you personally, but also to the society in which we live? If you're in the sociodemographic groups that Louisa has helpfully highlighted are disadvantaged here, then my prediction might be even *less* good for you, than it is, for you Sally at the moment.

So how do we have meaningful conversations about that particular issue that I think… doesn't hit the headlines because it's way too complicated for headlines, but we need to find ways of having that conversation better in public.

**Sally Sansom**

Yeah, I totally agree with you, Anneke, and let me know if this is incorrect. But I think what I hear you saying is, it's not that these approaches are not worthwhile exploring as potentials. It's just that there's not enough evidence at the moment, to make these sort of approaches possible. So it's an interesting area for further research, and more studies are needed to evaluate: does this actually deliver improved outcomes relative to the costs?

I also wonder if, maybe in some of our discussion, we've been thinking in quite a kind of zero to 100 way, and instead of going from a population-based risk screening approach, to identifying specific individuals and predicting that they will develop a disease in the future and being able to give them a specific intervention, should we not be working towards more of a step change based model, where maybe we can identify in the population a certain group of people who are at higher risk, but then narrow that down to a smaller group of people with more confidence?

**Anneke Lucassen**

Yeah, I think that's a really good point. But as we're doing those studies, we really need to look at what some of the downsides, or the things not talked about are. What happens if I identify a group, let's take a different number this time, but 50 people who are increased risk of something, but I need to treat all 50 to prevent one, that would be a sort of fairly standard ‘numbers needed to treat’ risk prevention, to prevent one from getting the condition.

Now, if the treatment is no risk, cheap, and easy to get to everyone at risk, then I don't see so much of a problem with that. But if the intervention is costly, or irreversible, or all sorts of other aspects to it, then I think we need to have more of a conversation about what does it mean to identify a whole group of people at risk of something, for most of them not to go on to develop it? We need to be better at having those conversations, I think, as we're moving to precision prevention.

**Louisa Chenciner**

I really liked your point, Sally, about this potentially being a stepwise change? And not something that's going to happen immediately, overnight. And if we think about some of the programmes we've already got in place in relation to prevention, I mentioned the NHS health checks earlier because I think that it is quite an interesting example.

So for those who don't know, NHS health checks were introduced in 2009, essentially to try to address premature deaths and morbidity related to cardiovascular disease, and they are administered by local authorities. And essentially, people who don't have underlying cardiovascular disease between the ages of 40 to 74 are eligible for five yearly health checks, and these might be provided at GP practices, but can also be provided in the community.

And there was a really interesting paper published last year by Erica Wirrmann Gadsby and colleagues, and they surveyed across the country different local authorities, and they found that many local authorities weren't consistently using factors like deprivation, ethnicity, other risk factors to prioritise invitations to NHS health checks. And qualitatively, people mentioned that often that data just wasn't up to date so it couldn't be used. And there were also challenges in relation to capacity, in terms of how to get that data and work with GPs to make sure people were best prioritised for health checks.

And I know that's a really simple example, but I think quite an important one? That actually, a national program that is already in place, even trying to personalise that, using relatively… what might be considered to be relatively crude sociodemographic measures of personalisation is actually already quite challenging but very important to do.

**Malte Gerhold**

So I think we've identified a number of points where personalising treatment or identifying risk that helps with screening, supporting people, can make a difference, but actually, *how* it makes a difference depends on lots of different factors.

One is, is it a particular condition or issue that actually affects a small group of people, or a really large number of people? Because if it's a small number of people, that might be a really effective and valuable intervention to support their health, but it might actually not help us to address the much bigger challenge of demand pressures on the NHS.

The second one is that… even if it is an area where it's one of the larger challenges for the for the NHS, and we can address it, we need to understand what the implications of that personalisation are for the capability that the NHS needs in order to follow through. So that might be to test and diagnose more people, because we get better at identifying risk more, which might cost money in terms of kit and in terms of staff. It might mean having the right number of staff who can actually then follow through in terms of the treatment to do that, or it might have implications in terms of how we support the individuals who are suddenly faced with more information, and might have to make information.

And the reason why all that matters is because, if we look at it from a purely health economic and policy perspective, we need to know the answer to all of those questions before we can say that this intervention is actually going to help reduce the pressures on the NHS in a way that also helps reduce cost over time.

And because we do not know the answer to many of those questions at the moment, I think we're still at the space of saying, this is definitely valuable, this is definitely important direction to go, but unless we help generate more evidence and explore more where it works, in particular in areas where it can address a larger significant demand pressure on the NHS, it's not yet at a position where we can definitively say where or how it's going to help us.

**Sally Sansom**

I totally agree. I think it's really important that we evaluate the outcomes of any potential programme or intervention, against the costs, and not just the cost limited to that one interaction, but the flow on cost from that and what's likely to result, but also to consider, of course, the opportunity cost. So if we're directing resources towards a new risk and prevention programme, what is that taking resources away from? The NHS is obviously a constrained system with a certain amount of resources that are not unlimited, and we need to be really careful about how we spend those funds.

I would just like to pick up on one point, Malte, that you made about the number of people who may be involved in a programme and likely to benefit, and while large numbers of people likely to benefit is a good indicative metric of whether something may be worthwhile, it does remind me of that 80:20 rule, you know, where a small number of patients say, 20% of patients generate about 80% of the costs.

And so I think it's important that we don't discount things that affect small numbers of people, because those may, in fact, be really expensive and have significant flow on effects, not only within the health system, but to carers and other aspects of the economy as well.

**Louisa Chenciner**

I think for me, when I think about opportunity cost, my main thought is not to pursue narrow definitions of personalised prevention at the expense of wider social determinants of health, which play such an important role, which I mentioned earlier in the podcast. So really important drivers of ill health, which include poverty, housing, education, deprivation, unemployment, and we need to make sure that we are thinking about *those* and not neglecting them with narrow definitions of personalised prevention.

**Malte Gerhold**

There's one final thing that comes out of this discussion really helpfully for me, which is that being able to tailor screening, subsequent intervention or subsequent treatment to people, even if we get really good at this, we can't forget that it's only one aspect of what affects people's health, and actually the much, much, much wider determinants that are also relevant to health behaviour, to the risk of disease, also need to be tackled if we actually substantively want to reduce the pressures that we face in our population and on health.

To be quite simplistic about it, it's great if we get way better at identifying risk of cancer and then personalising the treatment of cancer. If we don't, at the same time tackle contributions to cancer, such as nutrition, air quality and so on, we're never going to tackle the problem properly. And I think that applies for all things, whether it's obesity or something like cancer.

So for me, the key points that come out of this are: this is definitely part of the future, but we're still in a space where we really need to understand the evidence and the opportunities and in what field they're going to make the biggest difference, and for what reason. We're also really only in the foothills of understanding some of the implications that has, particularly for patients and clinicians in terms of how they interact, but also how they look at information, how they manage information, what they do on the back of that information, because it might become a lot more complicated the more personalised it is, about uncertainty and risk.

And then, really, from a policymaker perspective, the support we need right now is to generate that evidence and understanding, but also pick those areas where we already have the best possible evidence that it's likely to work, and explore further to show how it can change and shift actual aspects of healthcare, and not just particular moments of points of care.

**Louisa Chenciner**

For me, a lot of this relates back to health literacy. And, you know, if I think about currently, we still have this issue where, for example, someone goes to a hospital specialist, and they get a long, complicated letter, which has a lot of jargon, and then they go to the GP saying, “Can you help me to understand this?” And I suppose that's a sort of, very simple example that you worry about a bit, depending on how personalised prevention is implemented, that someone might have an amazing app with all of these figures and numbers, but actually still need that person at the centre of it who can help them to interpret… but not just interpret, but also understand and put it in the context of their life, and their concerns and what worries them and what they're sort of, I suppose, most fearful of.

I agree with Malte. It's very clear that personalised prevention is here, and there's huge interest in it and appetite for it, particularly politically. It remains to be seen how it will be implemented and developed over time. I think it's really important that we think about the social and cultural fabric of our societies, about trust and patients’ and populations’ appetite, I suppose, for personalised prevention as well. I think it's important that we stay close to the message that prevention full stop needs to be prioritised, that's an important first step, and how personalised prevention develops from there will remain to be seen.

**Anneke Lucassen**

I think that our ability to collect more data in lots of walks of life is such a great opportunity. And for me, the challenge really is how we engage with

the bits behind the headlines. How do we have conversations about where that opportunity may not work immediately or what the limitations of that opportunity might be?

**Rachel Horton**

Thank you so much for joining me for a really fascinating discussion. Risk and prevention is such a key topic in personalised medicine, and we got loads going on at the CPM looking at different facets of this. We’ve just held a research showcase which focused on personalised prevention, and a day discussing how newborn screening is evolving. So please check out our website, cpm.ox.ac.uk,

for more details on those and many other events exploring personalised medicine. Thank you for listening to this episode of the CPM podcast.