

## Audio file

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## Transcript

I'm delighted to welcome Doctor Anna McCready to today's seminar. Dr Anna McCready is an associate professor in the School of Agriculture Policy and Development at the University of Reading. As a psychologist and registered public health nutritionist, which has a broad range of interests in subject areas relating to consumer psychology, behaviour and food. Her areas of expertise include health related behaviour, change, personalised nutrition, behaviour change techniques, consumer perceptions of sustainability, human cognition and ageing. Her current research is focused on 2 main areas, personalised nutrition and consumer trust in the EU funded PAN European Food for meat Studies. She explored challenges and opportunities for dietary behaviour change to develop recommendations for personalised nutrition services and more recently, she took on the leadership of the large scale. Seven-year EIT, food funded Trust Tracker project researching consumer trust in the food system across 18 European country. Fees for other work includes EIT food funded research on household food waste and sustainable foods, and EU and FSA funded research into the effects of foods and nutrients on cognition. So.

There's a lot of information, very excited to hear about her online study on her side, nutrition and dietary behaviour. Range across 7 European countries, so without further ado, please Anna. Thank you.

Thank you very much indeed. Today I thought I would just cover three main areas. So what I wanted to give you was a bit of background on public health nutrition and where personalised nutrition fits into it and then I wanted to. Talk about food for me project which I worked on for 3 1/2 years. From 2011 to 2015, and I'll be talking about the studies aim methods and findings on personalised nutrition and then finally thinking about the future of personalised nutrition. So having a look at the challenges and the future prospects of it.

So really taking it and putting it into the context of business moving forward. Public health nutrition. So at the moment you will be very familiar with the eat well plate. Now this eat well plate assumes one-size-fits-all the issue being that public health guidelines for for nutrition are not really working. Awfully well. So diets may need to be tailored. They may need to be targeted to individual needs, and they need to be based person specific information to do that. Let's just think about public health nutrition. First of all, is there a consensus on what we should be eating and when you look at all the various food pyramids, eat well, plates, etcetera, there's there's quite a bit of variation across different countries. So just. For example, even thinking about fruits and veg, now we've got the five a day is is is our message. But you know in, in, in the US it's it's eight or more or nine or more. There's even talk of of of it being 12 a day. Would be the right the right way forward, so there's no real consensus on on what this public health nutrition rule should be. So when you're talking about one-size-fits-all there there, there's disagreement on that.

I think it might be a very good starting point. Think about what is personalised nutrition, so how we characterised it in our study back in 2011. This was at the start of the food for me. Project was personalised, nutrition is healthy eating. Advice that is tailored to suit an individual based on their

own personal health status, their lifestyle and or genetics. What we wanted to do was we wanted to take a look at this to see whether we could use personalised nutrition to bring about. Behaviour change. What I wanted to just flag up was another definition that I found recently. Now this is this was a a consent. Us personalised nutrition uses individual specific information founded in evidence based science that's similar to what we had before, but now we've got this extra bit to promote dietary behaviour change that may result in measurable health benefits. Giving you a. Bit of a clue there as to how our research went. Let's just have a look and see what different. Parents could personalised nutrition make.

We know that in terms of non communicable diseases, 80% of premature heart disease, stroke and diabetes could be prevented by diet and lifestyle factors. But the exciting thing for us here is that knowledge of the individual. And knowledge of nutrient gene environment interactions could revolutionise the delivery of of dietary advice, which could help lower any risk of of chronic illness such as cardiovascular disease, diabetes, cancer. And it could also increase motivation to change eating behaviour.

Let's look and see whether the right diet matters. So here is a study by Nelson and colleagues. They took 101 women and they put. Them on one of four diets for a whole year. These diets were low carb, high protein, very low carb, low fat, very low fat and they then got to the end of the study and they found that they they there weren't any real differences to get their tea. Cinti, which was a bit daunting, but then they looked at the genotypes and they worked out that there were three genotypes and they did this based on an array of genes. And they found that that there was a genotype that was responsive to a low carb diet and there was a genotype responsive to a low fat. Diet. There was also a balanced responsive so then they took a look at the data again. And they said. You know is is there a, a right or wrong diet? For genotype, interestingly, the correct diet was significantly more effective. So when they looked at things like change in body weight and they looked at the weight loss when the people were on the correct diet for them, they lost significantly. 4 kilos than if they were on the incorrect diet. So pretty fascinating stuff.

Then you look and you see well. What about what? About genes for obesity? Let's have a look at FT O gene and this is the fat mass and obesity associated protein gene. 16% of adults who carry the risk allele weighed 3 kilogrammes more, and that's 1.67 fold. Greater risk of obesity. Now this is an observational study. It hasn't. It's not a a randomised controlled trial. It is literally looking at the associations between 1:00 and the other. There was another study that looked at genetic Loki for obesity, and they found, actually. 14 Loki were associated with obesity susceptibility. 18 new Loki were identified, were associated with body mass index. They also showed that a greater number of risk alleles. Were associated with higher obesity risk. So there does seem to be some kind of genetic basis where linked to obesity. How about for metabolic syndrome? They did a a double-blind randomised control trial. It was a four week intervention for the treatment they gave 600. UA day of vitamin D3 versus placebo. And they found that the treatment actually reduced insulin levels by 15% and CRP by 54%. However, this only happened when there was for for those that had a low baseline vitamin D and higher. Had decline levels, So what they did was they concluded here from that that there was that Pheno there was a phenotype responsive to vitamin D supplementation.

So now I'm going to come to the food for me study. So what we did this was a a four year study €8.9 million and it was funded by EU horizon funding. It will involve 25 partners across 12. Countries, most of them were the EU, but there were also we we had partners in New Zealand, partners in States and so on. Now we had several work packages on business creation models. We had consumer attitudes to personalised nutrition. We had the A randomised control study. We also looked at technology and we looked at legal and ethics. Now our focus groups and questionnaire

studies in the 1st place were done looking at business models. And looked at. Consumer acceptance for personalised nutrition and we explored those in nine countries and we followed this up. Up having got the results, we followed that up with a human randomised control trial in seven countries. We needed just over 1000 and we got 12170 completing.

I wanted to just go through our aims. We have 3. The main aims for this study so. Our, our, our. Three main aims. The first one was to really explore the concept of personalised nutrition. We wanted to do this through a behaviour change intervention to work out what what the feasibility of this of this new concept was. We also wanted to find out what consumers knew about personalised nutrition and whether or not they would accept this, this this new concept. We also wanted to carry out a proof of principle human intervention study, because what we wanted to do was we wanted to identify key diet related genes and phenotypic measures parameters. We wanted to be able to mimic Internet delivered personalised nutrition service and we wanted to do this with our blood analysis and DNA home testing kits to see if those would be would would also work and finally to develop an online dietary or physical activity assessment tool. With our. Algorithms, because with with the idea that the the technology was was was developing in that direction and would enable us to do it. Finally, we wanted to be able to recommend the the the best business creation models and to examine the future of of this new concept. And to develop tools, evidence based tools for Internet based dietary advice. So how did we do? It we started off with the focus groups and we had a survey as well on consumer attitudes. To look at the sort of the psychology behind behind those, we then did our six month. It was a parallel randomised control trial in seven countries. We we we had four main groups, we had level 0 which was just receiving standard. Public health guidelines, you know, Fibre Day 2, two to three portions of this and that, etcetera. And then we had the first level where they participants filled in food frequency questionnaires and we gave them advice based. That the second level two was we gave them advice based on the food Frequency Questionnaire, but also on their blood markers and in the the the the final level Level 3, we based our advice on the questionnaire, their blood results. And their genotype, we also asked them to wear a physical activity monitor for six months, which I we thought would be quite challenging. But actually people were really good at complying with that. The other thing that. We we did was we wanted to. See whether the intensity or or the number of occasions of feedback had any effect or impact on behaviour change. With one group. We just gave feedback on baseline 3 months and six months and with the high intensity group it was baseline month. One month, two-month three and month 6.

So how did we go about? Yes, when I say recruitment via Facebook, this was very early days. This was 2011, two 1012 and Facebook had sort of started in 2008. So this was quite early days and so. But but but. We thought, well, we'll try recruiting via Facebook. Certainly in our, in, in, in our local centre, we didn't do awfully well that by that one. We did much better with press and radio, certainly in Spain for example, they put out a press release and they were oversubscribed. We we needed to get 235 participants per country and they they had 1000. Applications within 24 hours. Because the Spanish group was so excited about the the concept of of personalised nutrition in the UK, it took us, it took us quite a lot longer.

Now we had home measures, So what we asked people to do was we asked them to take swabs, DNA buckle swabs at baseline. We also sent them these dried blood spot dried blood spot kits and asked them to provide us with these little cards with their bloods and to send them in. Anthropometrics so height, weight, waist circumference, etcetera. Food Frequency Questionnaire, which I'll come on to in a minute. Dietary Change Questionnaire which really focused on the barriers that they might have have had to to change their diet to give us some sort of insight into the other things that were the non food things that might be stopping them. And of course, the the physical

activity monitor we provided, we emailed electronic dietary advice reports that these had to be done by Matt, by hand. And we gave feedback based on dietary algorithms, which I'll come on to in a second. We also provided an e-mail and telephone helpdesk support every weekday from 9:00 to 5:00.

So now we come to which genes did we actually test for, and which blood markers? Well, we used 5 gene risk variants and we gave advice on for FTO. We gave advice on body weight and ex. Size fads. One was advice based on omega-3 intake. TCF 7, L 2 that's transcription factor 7. Like 2 total fat intake based advice Apoe E4 that was saturated fat intake. Nice and MTHFR is was based on folate intake, four blood markers that we that we focused on were cholesterol which was about fatty foods glucose. Sugars, omega-3 fish, oils and carotenoids, which is I'm saying mainly fruits and vegetables, because of course it does appear in things like shellfish etcetera.

How did we, how did we go about it? So you imagine you are you are the the participant in the study we would send you. The link we would ask you to log. In and fill in. Your food frequency questionnaire now this. Adapted from the epic studies Food Frequency Questionnaire and Matt very clearly onto that and onto their findings as well. So we would ask them to put in what they'd eaten. And their portion sizes and then we would work out what? They had actually eaten. Now it's very difficult to see, but on the right you can see that we've used a a traffic light system to show. What their lower limits and the upper limits should be, and for micronutrients. We also did this for macronutrients. We did this for exercise. We did it for in a number of ways now. For instance, take calcium, so if you if you have a look at the top, we've got the little man from from our food. For me, logo and the the person, let's say it's a person and we have put that person who appears on the amber band. So we want the participant there to improve their calcium intake by including. Or dairy products, as these are the richest source sources of calcium. So that was how we how we did it are just going to just very briefly take you through this graded approach. So we have the lower reference nutrient intake band, we have the. Estimated average requirement and the upper limit as well. So, for instance, when you're looking at omega-3 polyunsaturated fatty acids, then you would you, you would have those limits showing you indicating to us where the participant comes on on this continuum.

Now this will be difficult for you to see. So I'll just. Cover this very briefly, so our dietary feedback system we developed this graded system for categorising nutrient intake and as you can see little traffic lights flag up to us on our system. The sorts of things that we need to look out for. And we were able to then use this to develop a system for prioritising the top three nutrient related goals, full participants. We felt that more than three would be too many for them to focus on. So we just gave them the top three and then we would identify the targeted advice that we. Need to give them. From this we ohh we also developed a decision tree with algorithms to link the data to on on the nutrient. Intake to the feedback messages so hundreds, literally hundreds of little feedback messages were created for each participant. We'd look up the correct algorithmic message and put that into their report, and then we develop these template feedback reports. For each of the eight groups, or in fact, six groups who were receiving feedback and that was for the delivery of personalised advice.

And then we created a website and also we used our Facebook page to be able to give people updates on the project and how we were going and exciting things that were going on in the in the field of personalised nutrition. And and so on and so forth. On the website we posted, our publications gave them all the information about us.

So now you're wondering, what did we fix? Mind, our first finding was that personalised nutrition advice delivered via Internet produced larger and more appropriate dietary behaviour change than the people who didn't get any feedback at all, but were just given the public health nutrition guidelines. So that was that was really good. What we've didn't find, we didn't find any effect of frequency. So those people who had to do the very, very long food frequency questionnaire once a month for the first four months. Code. No additional improvement to personalised nutrition advice and part of this was because what we were doing building these these manual reports was it was taking us quite a long time, so it might take us two or three weeks to get all the reports done. By which time they were just about to be asked to do the next food Frequency Questionnaire, so that could have been down to our responsiveness or our our resources when we looked at do phenotype or gene based advice. These vices do these make a difference over and above the food frequency questionnaire based advice, and we found no, there wasn't. It wasn't more effective than food Frequency Questionnaire, but what we did find was that for specific genes. Like the FTO gene, which is, which is a established gene for obesity, there were greater body weight and waist circumference reductions in risk carriers than in non risk. Areas and for the AP AOE gene personalised nutrition advice was more effective in reducing risk carriers. Fat intake. However, the flip side of that was that disclosure of no risk for that particular gene did seem to weaken. The dietary response to personalised nutrition.

So there was a really, really interesting findings. They weren't all the findings, but we we also, if you remember, did our focus groups. I want to remind you of those focus groups. Now those focus groups, we did those before we started the human study, the conclusions that everyone was coming to was that no, no, no. Definitely wouldn't do an online personalised nutrition study. No, no, I mean service. No, I wouldn't. I wouldn't use it. Because because we don't know who who it is, you know, could be some, some, some person who we don't. We can't see certainly can't see down in the basement we don't know if they've got any nutritional knowledge we don't know how how how good they are at managing and storing my data is it going to be protected. So no, we we want, we would prefer a face to face service so face to face provider is preferred. It is resource heavy, there are accessibility issues because you literally have to go physically go somewhere and but it is confidential or is seen to be. More confident. Sure. So the messages that were coming through was that online providers are were were feared there. It was acknowledged that they were resource light, but they were acknowledged to be accessible. But there were, there was always this, this this whole thing about privacy, data privacy and and that was very important to the consumers. That we spoke to. The conclusion is that that had been given to us according to what we were reading was that web-based E health resources were cost effective though fast delivery the better access. So that was the way forward.

So how do we then get people away from wanting that? Face to face provider and adopting the online provider. This so I'm actually gonna step out of the food for me project just briefly to have a look at trust and motivation and behaviour. Now this is from from my other study. It wasn't related at all to personalised nutrition but it was related to consumer. Trust in the food system, thinking about personalised nutrition service providers. They are aligned with the the food system. They are part of the food value chain because they link with it. In terms of health, I was, I've been sort of mulling over this soon as I got your invitation and thinking about, well, can we possibly apply the same sort of thinking that we've been looking at in, in the food supply chain to personalised nutrition or the concept and the idea and and the delivery of it? Just to give you a brief overview of this particular study, this is this is the Trust Tracker study. It's been going since 2018. We've collected something in the region of 57,000 surveys since it started, so this last year we collected just over 20,000. In 18 European countries, we developed a model of trust because this is is really hard to

find, you know, but hard to define. You've got, you know, trust in an individual. And then here you've got a trust in a system which is much more complex because it's made-up of so many different actors.

Similarly to personalised nutrition, what we looked at, for example, if you, if you see the the blue box in our scientific model, we have beliefs about trustworthiness. So trust is seen to be made-up of of perceptions of competence, care and openness or transparency, if you will. That transparency, or the the openness? We found was was the one thing that really it was the the most crucial part of trust. It was the thing that that actually drove confidence, people's confidence in their foods, their the technologies that they were using, products and services and so on. And these beliefs in trustworthiness. Of particular providers actually mediates the relationship between motivation. And intention so motivation to eat more healthily, for example, intention to actually do so and so trust helps to mediate that gap between changing, you know. Yes, I want to do it to I'm I'm gonna do it. So openness and transparency is is is critical.

One of the findings that we had. From our study, because we we we looked at. Consumer perceptions to farmers, manufacturers or processors, retailers and governments, or or authorities, as you'll see if you don't have to see, be able to see this the, the, the bottom left graph, but I can tell you that the authorities are bumbling along at the bottom, so the lowest white. Are shows there is least now least amount of trust in authorities? These are the people who regulate who, who, who, who come up with the rules, who who actually enforce. Data protection. Who actually enforce all? All of these? All of these aspects, so you can see that that there are sort of synergies between between the two projects there having blasted you with with all of with the with a whole new project in in, in about four minutes. I just wanted to go back to personalised nutrition. And just contemplate and just reflect on what these challenges for personalised nutrition are for for the future. Now I found Adams who who came up with the Adams and. Metal they came up with the definition that I showed you right at the start and what they they discussed was that personalised nutrition approaches hold promise for public health in the future. That what's needed is more research. We need to know whether the dietary intake measurements. Are accurate. We need to have standardisation of systems approaches. We need to have application and and communication of evidence. So just to remind you, I mean this this trusting provider is is incredibly important and this comes up again and again in the literature with regard to personalised nutrition, we know that there's openness or or transparency is essential for confidence in products and services in relation to foods. We know that. Data privacy and data.

Management or the quality of advice is also a a challenge. Who who actually regulates this for these things for a personalised nutrition? There are also cost implications for members of society who would benefit most. So in this country we we have this expectation that the NHS. Is free, so therefore health provision should be free and that may affect adoption or uptake of a personalised nutrition service. If it does have a high cost to it, then the people who really, really do need the the, the the additional assistance, the addition. To help, they're the ones who wouldn't be able to afford it. And finally, and this is the most important part of this, is that the evidence base is limited. We looked at, I think, over 100 snips, 100 genes and we focused our study. On five of these. So there are potentially other other genes that people could. Cat and it's possible that not knowing enough about these gene nutrient environment interactions could have influenced the the the efficacy of those kind of methods in and treatments in our study, so evidence. Space is limited. It draws largely on observational or risk association studies, so definitely more research and more regulation is needed.

So I found this is again from Adams ET al. If the group that group came up with 10 guiding principles for personalised nutrition. So I thought I would share them with you just at this point. And these are

to to to define the beneficiaries to use validated measures. And method. To really maintain the data quality and relevance, that's that's key. And to get recommendations from models that have been validated, algorithms that have been validated. So it's going to be data-driven and evidence based. One of the others was to design user friendly. Tools to make it more accessible and you know a lot of pleasure to. Actually do these. Adopt these services and to align with population based recommendations. Which can be tricky as you saw at the beginning, different populations will have different different guidelines, and the last two I think are key.

We we we need to communicate transparently about the potential effects, the good stuff, the bad stuff. Consumers have so much more access to knowledge these days. They can go and and look it up for themselves. So there is a greater expectation nowadays than there ever was before for transparency. Certainly when trust studies have been done in the past, transparency has been less important than competency for things like food safety. So this is this is something that has come about as as part of a societal change, protecting individual data privacy and acting responsibly. That is a a key goal for the future.

So talking about the future, let's just have a look at some of the opportunities there are for the personalised nutrition market. Well, the estimated market size in Europe is 42 to 93,000,000 consumers and its potential value. It was 8.1 billion in 2020. And it's. Thought to be A to to to grow to 9 between 19 and 46. It's quite a range billion EUR by 2030. Those socioeconomic shifts, those all important shifts, there is an increased focus on health and Wellness. There's much better access to knowledge and there is an increased demand for transparency, but also regulation I've got. Mike Gibney, he was the project overall Pi, he said. The complexity of a personalised nutrition business model and its strong link with societal change indicates that personalised nutrition will probably develop as a result of initiatives. Where public and private interests are combined so it it, it needs to, it needs to serve both those kinds of interests. Now costs well for a full personalised nutrition service. They these are estimated to be between 200 and €500. That includes the follow up and about half of that. Is, you know Will will be spent on diagnostics we. Need integrated and validated science, so you need to focus on the nutrition aspects, but also the behavioural aspects and really get a get a a better understanding of the science behind it all, different ways of categorising individuals.

So for example people been talking about. Precision Nutrition, which is slightly different to personalised nutrition. This is when, when specific illnesses, diseases are are are targeted by by nutrition, so also new and evolving technologies we've we've got good opportunities there and to provide standardised. Automated feedback to reduce risk of inconsistency and error through the use of algorithms. See here on the right we've got the E Nutri app that was a funded project that's actually ongoing at the moment, and that's also University of Reading, but that is developed. That app has developed. Out of food for me, so nearly there.

Nearly finished here just to have a look at personalised nutrition services. Their future in practise so. I found a few examples on on the Internet on the web, so we've got well, you've got genomics, you've got proteomics. So now we've got preventor mics now prevention thics is a is is actually a study that's looking at advising people on their shopping habits. You know what to buy and what recipes. To to to use. So we've got. Yeah, that's one type of example targeting one part of the consumer consumption phase.

Then we've got noon. That's that's really focusing on the psychology aspect or the behavioural aspects of of eating and the bottom right, we've got your waste loss, weight, weight loss waist as well weight loss programme, type of of application here. So helping people to to develop sort of

personalised or to to to lose weight based on more personalised advice and the top right, that's the CRISPR project. This is again, it's EIT food funded. And it's, I think University of Reading is working with with quadrum on this. So CRISPR is seeks to validate the science. So what this is a more of a business to business organisation or or project and it is there to provide personalised nutrition. Device or or organ or service set up. Advice to companies wanting to be able to run a personalised nutrition service so that is more of a sort of it's going towards the regulatory aspect. It's trying to set standards in the field.

So there are some ideas. I just always want to thank all all partners that I've worked with on. On both of those projects. So the bottom ones are the trust tracker project and all the top ones were in the food for me project and I'm going to stop talking now. So thank you so much for listening.