Harry Kennard 0:17

Hello, and welcome to episode six of the climate change and health podcast from UCL. I'm your host Harry Kennard. And in today's episode, I'm talking to Dr. Marco Springmann, all about diet and health. Marco is a senior researcher at the environmental change Institute at the University of Oxford. And his main interests are in the health, environmental and economic dimensions of the global food system. In the spirit of full disclosure, he and I have worked on some papers together. And when he and I were chatting, just now he put in a request for some techno music to be included in the podcast if he's a fan, he asked specifically for hell and a half. And unfortunately, she doesn't have any free music available. We operate on a tight budget here at the podcast. So I had a look at Free Music Archive to organ pulled out some biometric which I thought was quite appropriately named for today's episode. I don't think it's technically techno. It's not my field of expertise. But you can hear that the end. And my thanks to the the artists there, you can check out the rest of their work. It's also important for me to give my normal thanks to Kevin MacLeod for the track funk horrific, which is the theme tune of this podcast, I found out on free pd.com. So without any further ado, here's my chat with Marco about diet, agriculture, and their impacts on health and climate change. I hope you enjoy it. Thanks for listening. I am delighted to welcome Dr. Marco Springmann to the podcast, I start all these podcasts by asking whoever I'm talking to, to give a little background about how they got interested in environmental issues. And specifically on the work you work on now, which is the impacts of diets or simply body broadly defined. Is that the right thing to say Marco?

Marco Springmann 2:13

Yes you can say so it was a very long, long and winding road. In my case, really. So I was specialising in my PhD on theoretical particle physics, and especially string theory. And I'm in a programme in the States. So where you still have to do quite a lot of coursework. And I remember coming to this string theory class that took me ages to be able to take to build up to to understand what was written on the blackboard there. It was one of those days where in the news where, again, some elections in some random country, country and civil wars breaking out afterwards. These days, it could be just as well, sort of the US or the UK. But back then it was a place in Sub Saharan Africa. But I really thought maybe I should do something more useful with my life and thinking about some funky transformations in 10 plus one dimensions.

Harry Kennard 3:16

That's interesting. That's sort of the same path I had, in a way I think I fell off the theoretical physics train much earlier than you I never got to the anywhere near string theory, but I had a similar sort of feeling. There was some point you think, why not yeah, do something useful? Yeah. Sorry, I interrupted you. But that's all fine.

Marco Springmann 3:43

Seems like physicists sort of predestined to jump fields really? Over the years, you read quite a few, right? Yeah. And yeah, I mean, I guess the nice thing with physics is you're you're so butcher to learn sort of

maths, coding and all kinds of stuff to give you a little bit of flexibility of what other at least quantitative field you want to work in. So with my interest, I thought, Oh, well, you know, I can probably do something about climate change research. So I changed from physics department to the atmospheric science department and did a year of research on aerosol physics and chemistry, looking at sub particles and what goes on there. And at the same time, you know, taking classes on climate change, and all that. And I thought, yeah, okay, that's all cool. And I sort of enjoy it. But at the same time, I was thinking, Well, you know, the sciences, pretty well established. I mean, it can always be better, but it's established enough to give politicians something to act upon, and they surely should do so. So why is nothing happening? And so I thought, okay, maybe instead of Natural Science, I really should do social science. So I switched and I said after a year will give me a master's in physics. For a year of research, and I do go off and do some social science. So I did another degree in sustainability after this. And then did my PhD that I eventually finished on distributional impacts of global climate policies, looking at what would happen if you shift emissions responsibilities from a production side to a consumption side. And during this, suddenly the food system pops up to quite some degree. I mean, if you check it to all kinds of production sectors, you don't see it so much. But if you collect it in terms of a consumption responsibility, angle, then it's quite big there. And at the same time, I was always interested in the health implications of dietary change. So I thought, well, for my postdoc work, I could maybe combined climate change work that I had been dealing with and with my personal interest on healthy diets, and look at healthy and sustainable diets. And yeah, for the last eight and a half years, I've been on that.

Harry Kennard 6:05

That's where you've been, wow, that's, that's quite a story. It's sort of it actually resonates very much. I think I haven't ended up in exactly the same place. But I think I did the same. I think I did the same journey. So I started on the theoretical physics thing. And then, at some point, got very dissatisfied with it, and thought I would need to do linguistics. And so I shifted fields and sort of justified it from a sort of, sort of justified it from being really into Chomsky, which I really wasn't, I didn't understand what Chomsky was saying or anything about that generative stuff. But I really liked the sort of the social constructed aspect of of language now they're changing.

Marco Springmann 6:40

And wasn’t be all wrong in linguistic?

Harry Kennard 6:45

Well, I think that's yeah, I mean, that's, that's the other thing is it's, I think I was my intuition was a little bit yes. Sorry, Noam. But yeah, and then and then from that sort of arrived energy, because it was this somehow this sort of meeting of the, of the both sort of quantitative stuff, and then also as a sort of a relevance that really isn't. It's not it's not there in theoretical physics, but it's, it's sort of harder to, it's harder to justify your effort somewhere.

Marco Springmann

Yeah, exactly. I mean, if you work for, I don't know, five years on some miniscule aspect that doesn't really push the boundaries of knowledge. Much, then you have to ask yourself, what is your contribution? Right? And is exactly needed there? Yeah, exactly.

Harry Kennard 7:28

There may. Yeah, low hanging fruit is probably the highlight of my labour, the metaphor, there's more low hanging fruit in the fields that we found ourselves in. To which sort of useful segue. There was my my first question, I suppose, or my second. So really central to your, to your research, is this observation that different diets have different health impacts. And so intuitively, people, people know that eating is important. And intuitively, people know that. Different things have different effects on how they feel and eventually how, what their health outcomes are. Can you outline a little bit how that process works? How it is that different foods impact our health in different ways?

Marco Springmann 8:14

Yeah. Or maybe stepping back one, one step to think about how we know that different foods? Yes, yeah, of course, we saw that. Yeah. I mean, you know, I didn't appreciate that for a really long time. It was only during my physics PhD studies that I had come across epidemiological cohort studies that attempt to in a rigorous way study what are the relative impacts of eating for example, one more serving of fruit and veg, or one more serving of red and processed meat. And all of those things that I really started appreciating, oh, there is actually a very good science behind studying healthy eating. That goes beyond sort of this, folks. folksy knowledge of oil just just due to a bit of everything, right. Actually, we know now fairly well, but healthy limits or relative healthy guidelines for, for eating. And the best evidence we have from those from what are called meta analysis of epidemiological cohort studies. Meta analysis, study studies that collect different individual studies, different individual cohort studies, and with some statistical wizardry, construct a consensus estimate from those studies. Those cohort studies or any individual cohort study just for a bit of background, they involve like 10s to hundreds 1000s of participants. And how it works is you recruit them at some point and you administer quite a lot of surveys. Sometimes you measure stuff yourself, and you collect lifestyles, how much do they weigh? Do they smoke? How much? How much physical activity do they do, and very critically for healthy eating, what do they eat, and how much how many fruits and veg how much red meat and all those things. And you need quite a lot of numbers, high numbers, because in the end, you want to find groups of people that are the same on all aspects, but differ only in one, for example, the amount of red meat they eat. And not only do you need a large number to find those two statistical groups, but you also need a high number because you actually need to wait quite a bit, you need to wait that people in those cohorts get ill. And that usually, I mean, that might happen all the time, depending on what your baseline age is in those cohorts. But usually, you know, even from the time people get ill, and you want to make sure that at baseline, they are not ill right, because otherwise that might be introduced confounding effects, because you don't know what they're getting ill from. So you need to wait until they get ill from a relatively healthy state in those cohorts. And then usually until they die, because you want to also record from, what they died, what disease they had, and so on. So you set them up, and then you literally wait for a decade or something. And very often you wait even longer. So those kinds of cohorts are conducted actually in all kinds of places. So there are some in Northern America, there are some Asian cohorts, some British cohorts, and so on. And all of the those, if you read the papers, the papers are usually fairly boring because they're so standardised because the methods have been established to quite a standardised degree, which is good. But they brought more or less investigate the same stuff. So they investigate, okay, what happens if those two statistically similar groups eat different levels of whatever food group, and what was established very well in those is that range of foods have

Unknown Speaker 11:59

effects that reduced diet related disease incidence and mortality, and the range of food groups increases those. So the ones that decrease those are fruits, vegetables, legumes, nuts, and seeds, and whole grains, the ones that increase our red meat, unprocessed red meat, processed meat in general, sugary beverages, and that's basically it. So we're dealing with those sort of eight, about eight food groups that have been shown to be very sensitive to changes. And all of those have been investigated. Also holding those other food groups constant, that is from an observational side. So let's say you know, what you get out there is eating one more serving of red meat increases your risk of dying from diet related disease by roughly 15%. And the same kind of order of magnitude you get in the opposite side reduction of that if you eat, like one more serving of fruit and veg, just as a general order order of magnitude there. This is obviously all observational, so this in theory could be confounded by any amount of unobserved factors that play a role in the disease aetiology. So in order to make this more credible, what people are looking for, also impacts on so called intermediate risk factors, those can be observed within the same year and change with it in the same year. So those would be blood pressure, cholesterol levels, those kinds of things. And there have been an because they change fairly rapidly. You don't need to do those long observational studies, you can actually do some randomised control trials, which in general, are a bit more rigorous scientifically, and they can be done on those timeframes. Whereas those long observational cohort studies with those final endpoints of mortality, that no RCT can really be conducted, right. But on intermediate risk factors they can

Harry Kennard 14:17

that would be a bit like that guy. Now, what was his name? About 10 years ago, who only ate McDonald's for a month? And then generally felt terrible afterwards? Right? Is that the sort of, is that what it would look like? You'd sort of say, here's something that he's going to mention, you know, double your beef intake. After that, keep everything else constant. See what your various underlying indicators of the disease are like, Is that is that?

Marco Springmann 14:41

Yeah, sort of. So that would be a controlled feeding study. These days, it depends what you're changing in how you're changing the diet. So you might get some trouble with getting your ethics if you know that it is much unhealthy or what you prescribe to people. So usually you try to just offer two different versions and give, give the participants a little bit of freedom, what they choose, and you hope you get a little bit of spread in those. So also, randomised control trials are not, you know, are not the answer to everything, because they are still they are super context specific right, of how they are conducted, and are very short in terms of their timeframe. But nonetheless, what they find in those is that changes in intermediate risk factors like blood pressure, cholesterol levels, go go in the same direction. So your blood pressure gets worse if you eat red and processed meat, and it gets better if you eat all the plant based other stuff. So that is good. And then the last round of evidence that you want to have is, if possible, you also want to really understand why is it that those foods have those impacts. And for that, you usually need some animal models to understand the pathways. So you do some experiments in mice, where you try to establish an actual pathway.So by doing that, and that is sometimes called mechanistic studies. I mean, there are some things you can do in in humans as well. But by and large, those mechanistic studies are more animal based. And they're they tried to figure out, okay, how is it that this has this and that impact? So, for example, for red meat, the things that have been always discussed to be in the causal pathway. And that not only comes from mechanistic studies, by the way, but also from observational studies, where they control for those are the levels of fatty acids and meats. So there's lots of saturated fat and meat, which has been shown to not be very good. There's cholesterol and red meat, which is not exactly healthy. There. There is heme iron in red meat. Well, in all meat really. That has been that might be in the causal pathway. And lastly, there are nitrates and nitrates, nitrates that are in specialist specifically processed meat in addition to salt. So those two things you're thinking and cured meats, especially Is that Is that right? Exactly. So because of the high levels of sodium and those nitrates and nitrates. Those two things might be the reason why especially processed meat is unhealthier than unprocessed red meat. And those things might interact with some other advanced advanced oxidation products here that are formed by actually barbecuing or frying the meat. So there are other interactions that that take place then. So lots of different things. And conversely, for fruits and vegetables, we know that a range of polyphenols and phytochemicals that are probably responsible in concert for reducing oxidative stress and reducing diet related disease and incidence.

Harry Kennard 18:24

That’s, that's very comprehensive. Thank you for that. Overview. I think that's that's as about detailed description of it I've ever heard. One thing that one sort of does come across, in I suppose that sort of shadier parts of Facebook. Are these arguments that people say that red meat is actually fine for you. It's really It's essential, because we've got, you know, hunter gatherers, all these kind of things, which are a bit a historical and the kind of kind of confused in the way that they're they're argued. one does encounter, I suppose you encounter a lot the argument that yeah, if if if meat is lean, and doesn't contain fat, then it's not bad for you is that? Is that still the case?

Marco Springmann 19:08

From what we can see, that is not the case. So we can do some, for example, health analysis, based on those intermediate risk factors and actually, prospectively changed a fatty acid composition by taking into account the relative risk factors for those specific ingredients. And there, we see that the fatty acid composition doesn't really matter that much. So heme iron, and those nitrates and nitrates might be more responsible for the final health impact. I mean, not one thing can explain it explained the full impact anyway, so there are probably lots of things going on. Which is the reason why this sort of meal in a pill or in a shake is kind of ill guided because you can never you never know exactly what is responsible for what and you can never isolate the one active ingredient. So in the past people have tried that, and they came up with this sort of vitamin classification. And I thought, oh, yeah, you know, any health benefits are just due to certain vitamins. And since then we know that is not the case. So the vitamin C potential of any any food is much less than the actual impact that food has on on diet related disease incidents. So and similarly for for red meat, we don't know exactly which one does something, to what degree, but we can say that if you change one of those aspects, probably wouldn't take away the detrimental health impacts. Similarly, all the observational studies that look at different kinds of meat, the newer ones, they do something interesting, they call substitution analysis. Because what also seems to matter is obviously what your baseline diet is, right? So if you compare somebody who has a fairly healthy diet, with hardly any meat with somebody who has eats tonnes of meat, and you see probably big impacts, if you have the baseline comparator, as somebody who eats also fairly unhealthily, maybe not so much, right. So what people do there is they try to identify groups of people that seem to have substituted, for example, the protein section of their foods. So going from processed meat, red meat, to poultry, to dairy, to eggs, and so on. And what you can see there is also a very nice relationship, or a very nice order by which any of those major foods are, are unhealthy or healthy. So you see that processed meat is unhealthier than unprocessed red meat, which is healthier than poultry, which is similarly healthy or unhealthy to dairy and eggs, which is. And then it gets further and all of those plant based foods like nuts, legumes, fruits and vegetables, now always healthier than any of those meat categories. So from that, even if you wouldn't believe the absolute impact, the absolute relative risk that is deduced from those epidemiological studies, you still see this ordering or classification of what is relatively unhealthy and what is relatively healthy everywhere, basically.

Harry Kennard 22:48

So there'll be there'll be, there'll be an argument for making a substitution along that sort of healthy, healthy sort of chain, almost, or whatever stage you are. So if you're eating a lot of processed meat, then red meat and moving to more poultry would be relatively better. Is that the right way of putting it?. And all of this sort of interacts with whatever underlying state, the population as a whole is in in terms of disease prevalence and what other diseases are going on, and all the rest of it. And so correct me if I'm wrong, but you, you would see these dietary impacts most in countries where people live long enough for the impact of these factors to become clear.

Unknown Speaker 23:45

Yeah, no, you can say that. So in some Asian cohorts, actually, there are only some long term health impacts you don't see so much yet, especially specifically those related to read and process meat, because it takes time for coronary heart disease, stroke, cancers to develop. So there and there, you have lots of confounding with socio economic status, because very often, people with a higher socioeconomic status, eat more red and processed, mostly red meat in in China, for example, but they also have access to better healthcare services. So you get lots of confounding there. But one thing that changes relatively fast is type two diabetes. And now you can already see the impact of it. So that gives you sort of a little bit more fast track picture of where the disease progression is going.

Harry Kennard 24:31

Fascinating. Okay. So that's, that's definitely something that's important for whoever's listening to this podcast is to sort of think about their own. I mean, that's one thing, I suppose maybe to sort of recast that slightly glib comment is that how does one make an assessment of these epidemiological population level effects in terms of your own dietary choices? Is there an equivalence with all this with something like smoking where, you know, it's very well established that it's harmful for you? And certain people will smoke and love smoking. But do they just have to know that there's a there's an impact on their health fair? I mean, it's it's, is that the easy way of putting it? Or is there another way?

Marco Springmann 25:13

Yeah. So what is done with those epidemiological and other studies is very often that they are taken as the basis for developing general dietary guidelines for healthy eating in that case. And what you're looking for, in those they are called dose response curves, what is the derived in epidemiological studies, and they give you an indication that something might be causal, right. So if you eat more of a thing, you have more of an impact, or if you eat less of a thing, the lesser you eat, the less impact you have. So, and based on those, there is no reason why any of those might be completely linear. And there might be somewhere a cutoff point. So for example, maybe if you eat a certain number of fruits and vegetables, at some point, you don't need anymore, right? You sort of use saturated. For it used to people used to think that with fruits and vegetables is at your five a day, right? So therefore those recommendations came about, I have five servings of fruits and vegetables, actually, since then, if other epidemiological studies came out that had higher exposure levels, meaning people who ate significantly more than those five, and they could still demonstrate additional health benefits. So it just happened that in those older cohorts, not very many, especially in high income countries, not very many people even made those five a day or even more, but now you actually see that even eating more than five for days still better. Conversely, the ones that look at red and processed meat, they usually find an increase in risk going from the very lowest quintile or quartile or whatever. However, they passion their consumption data to the next level. So there is always an increase in risk. So from that you can deduce that met so called minimal risks, risk exposure level is basically zero. That doesn't mean you should not eat any, it's obviously up to you how much you eat. But if you want to minimise your risk, zero would be the risk minimising level there. And if you put all of those together, you can basically construct general dietary guidelines that tell you okay, and on on a given day, or per week, what are the foods that you should should eat? And how, how does a sort of well balanced and well composed diet look like?

Harry Kennard 27:48

Right? That's, that's really clear. So just sort of stepping to the other side of the coin, if that's the right way of putting it there. The agricultural system has a number of impacts on the environment, in terms of different food raising, you get different stresses on different aspects of the environmental and resource chain. So just off the top of my head, there is this sense that almonds are very water intensive, I hear that in respect of California, can you sort of step us through a bit some of the biggest impact of all these decisions and what they are doing to the planet, sort of globally, and then also, you know, in particular regions where it might be better than to avoid certain foods in favour of others?

Marco Springmann 28:39

Sure. I mean, the food system is tremendously resource intensive. If you put put your bird's eye view on then it's responsible for about a third of all greenhouse gas emissions. Agriculture is done on about 40% of the Earth's land surface, it uses more than 70% of all freshwater resources. And the over application of fertilisers has already resulted in quite a number of so called dead zones and oceans that are depleted of oxygen levels. So there is tremendous environmental impact associated with the way we produce food at the moment, and we projected that if we don't change course, those impacts would increase by about 50 to 90%, up to 2050. And by then, exceed all key environmental limits of planetary boundaries, as they're sometimes called, that are related to agriculture. And those would be limits due to climate change. So it would further basically extreme weather events and other things that are related to climate change that are related to freshwater use and, and ecosystems. Land use biodiversity loss and biogeochemical flows of nitrogen and phosphorus. So we're really in deep trouble if we don't change course in the way we to produce food and the the kinds of foods that we that we produce.

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